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THE RELATIONS OF VEGETATION TO BIRD LIFE IN TEXAS.

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(Conclusion.)

Toxicodendron radicans
Celastrus scandens
Acer rubrum
Parthenocissus quinquefolia
Passiflora incarnata
Opuntia macrorhiza
Raimannia laciniata
Cynoxylon floridum
Diospyros virginiana
Convolvulus repens
Datura stramonium
Datura tatula
Solanum elaeagnifolium
Campsis radicans
Sambucus canadensis
Sonchus asper
Sonchus clearaceus
Senecio ampullaceus
Senecio vulgaris

Cultivated crops:

Barley
Bermuda grass
Broom-corn
Corn
Hungarian grass
Johnson grass
Kaffir corn
Millet
Oats
Rye
Sorghum
Sugar-cane
Wheat
Onion
Fig
Beet
Spinach
Sugar beet
Cabbage
Mustard
Radish
Currant
Gooseberry
Blackberry
Raspberry
Strawberry
Apple
Pea
Peanut
Flax
Grape
Cotton
Okra
Celery
Cape jessamine
Egg plant
Irish potato
Pepper
Sweet potato
Tobacco

Pear
Apricot
Peach
Plum
Alfalfa
Bean
Cowpea
Tomato
Cantaloupe
Cucumber
Pumpkin
Squash
Watermelon
Lettuce

The birds found here are:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Polyborus cheriway auduboni (R)
Buteo borealis borealis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Meleagris gallopavo silvestris (R)
Tympanuchus americanus attwateri (R)
Colinus virginianus virginianus
Oxyechus vociferus vociferus
Bartramia longicauda (R)
Zenaidura macroura marginella
Coccyzus americanus americanus
Colaptes auratus auratus
Melanerpes erythrocephalus erythrocephalus
Dryobates pubescens pubescens
Dryobates villosus audubonii (R)
Otus asio asio (=*floridanus*)
Strix varia alleni
Tyto alba pratincola (R)
Chordeiles minor chapmani
Chordeiles minor howelli
Archilochus colubris
Chaetura pelagica
Horizopus virens
Myiarchus crinitus crinitus
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos polyglottos
Dumetella carolinensis (R)
Sialia sialis sialis
Polioptila caerulea caerulea
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Penthestes carolinensis carolinensis
Cyanocitta cristata cristata (=*florincola*)
Corvus brachyrhynchos brachyrhynchos
Corvus brachyrhynchos paulus
Vireo bellii bellii
Lanivireo flavifrons
Vireosylva gilva gilva (R)
Vireosylva olivacea
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Progne subis subis
Geothlypis trichas trichas
Sturnella magna magna
Sturnella magna argutula
Sturnella neglecta neglecta (R)
Icterus galbula (R)
Icterus spurius
Quiscalus quiscula aeneus
Molothrus ater ater
Piranga rubra rubra (R)
Richmondena cardinalis magnirostris
Guiraca caerulea caerulea
Passerina ciris ciris
Passerina ciris pallidior
Passerina cyanea
Spizella pusilla pusilla
Spizella passerina passerina
Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Passer domesticus domesticus
Astragalinus tristis tristis (R)

Inland Prairie Association.

This includes the open grassy prairies of the eastern and east central interior portions of the State, including those between the Upper and Lower Cross Timbers. On these prairies the principal vegetation, aside from the grass which covers them, is a great variety of low flowering herbaceous or suffruticose plants. Occasional bushes and here and there a live-oak or other low tree form the only woody vegetation. The avifauna is consequently distinctly campestrian and lacks the purely thicket and forest elements.

The important plants are included in the following list:

Agrostis alba
Agrostis elliottiana
Andropogon chrysocomus
Andropogon glomeratus
Andropogon scoparius
Andropogon virginicus
Aristida tuberculosa
Bouteloua gracilis
Bouteloua hirsuta
Chaetochloa geniculata
Chaetochloa gracilis
Chaetochloa italica
Chaetochloa lutescens
Chaetochloa viridis
Eragrostis capillaris
Eragrostis curtipedicellata
Eragrostis lugens
Eragrostis pectinacea
Eriochloa punctata
Festuca sciurea
Holcus halapensis
Hordeum jubatum
Koeleria cristata
Limnodea arkansana
Melica porteri
Muhlenbergia capillaris
Panicum anceps
Panicum brachyanthum
Panicum capillare
Panicum dichotomiflorum
Panicum fasciculatum reticulatum
Panicum filipes
Panicum flexile
Panicum geminatum
Panicum helleri
Panicum lindheimeri
Panicum ovinum
Panicum praecocius
Panicum ravenelii
Panicum reverchoni
Panicum scribnerianum
Panicum sphaerocarpon
Panicum texanum
Panicum thurowii
Panicum virgatum
Poa arachnifera
Poa glabrescens
Sphenopholis hallii
Sphenopholis interupta
Sphenopholis pallens
Sporobolus argutus
Tridens strictus
Sisyrinchium amoenum
Sorghastrum nutans
Sisyrinchium brayi
Sisyrinchium canbyi
Sisyrinchium flaccidum
Sisyrinchium furcatum
Sisyrinchium langloisii
Sisyrinchium minus
Sisyrinchium pruinosum
Sisyrinchium texanum
Sisyrinchium varians
Cerothamnus cerifera
Quercus virginiana
Ranunculus macranthus
Argemone alba
Argemone delicatula

Argemone hispida
Argemone platyceras
Euklisia hyacinthoides
Lepidium austrinum
Lesquerella auriculata
Lesquerella pallida
Lesquerella polyantha
Lesquerella sessilis
Streptanthus maculatus
Prunus glandulosa
Prunus minutiflora
Morongia uncinata
Parosela aurea
Parosela dalea
Parosela enneandra
Petalostemon candidus
Petalostemon decumbens
Petalostemon emarginatus
Petalostemon multiflorus
Petalostemon purpureus
Vicia texana
Chamaesyce malaca
Chamaesyce nuttallii
Ditaxis humilis
Cratiola pusilla
Otophylla densiflora
Pentstemon cobaea
Pentstemon helleri
Pentstemon murrayanus
Diapedium attenuatum
Galium virgatum
Houstonia angustifolia
Cymbia occidentalis
Lactuca ludoviciana
Sitilias grandiflora
Ambrosia bidentata
Aster azureus
Scutellaria cardiophylla
Scutellaria drummondii
Scutellaria resinosa
Physalis pumila
Agalinis heterophylla
Agalinis strictiflora
Conobea multifida
Opuntia macrorhiza
Mentzelia oligosperma
Galpinsia hartwegii
Galpinsia interior
Gaura villosa
Hartmannia speciosa
Cogswellia daucifolia
Eurytaenia texana
Phellopterus macrorhizus
Spermolepis divaricatus
Trepocarpus aethusae
Sabbatia campestris
Vincetoxicum biflorum
Vincetoxicum cynanchoides
Convolvulus hermannioides
Convolvulvus incanus
Nemophila phacelioides
Phacelia glabra
Verbena bracteosa
Verbena canadensis
Verbena drummondii
Hedeoma acinoides
Monarda clinopodioides
Monarda dispersa
Monarda lasiodonta
Monarda scabra
Monarda stanfieldi
Monarda tenuiaristata
Aster drummondii
Aster exiguus
Aster hirtellus
Aster oblongifolius
Aster poaceus
Aster trigonicus
Centaurea americana
Echinacea angustifolia
Gaillardia amblyodon
Gaillardia chrysantha
Gaillardia fastigiata
Gaillardia lanceolata
Gaillardia pulchella
Gaillardia suavis
Gaillardia trinervata
Grindelia grandiflora
Grindelia inuloides
Grindelia lanceolata
Gutierrezia sphaerocarpa
Gutierrezia texana
Helianthus grosseserratus
Helianthus orgyalis
Helianthus scaberrimus
Hymenopappus corymbosus

Hymenopappus tenuifolius
Hymenopappus sulphureus
Laciniaria langloisii
Ratibida pinnata
Ratibida tagetes
Rudbeckia alismaefolia
Rudbeckia grandiflora
Rudbeckia subtomentosa
Senecio ampullaceus
Senecio fremontii
Silphium asperrimum
Silphium gracile
Silphium integrifolium
Silphium laciniatum
Silphium speciosum
Verbesina helianthoides
Vernonia baldwinii
Vernonia drummondii
Vernonia fasciculata
Vernonia interior.

The birds living here are as follows:

Coragyps ururbu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Polyborus cheriway auduboni
Buteo borealis borealis
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Tympanuchus americanus attwateri
Colinus virginianus virginianus
Oxyechus vociferus vociferus
Zenaidura macroura marginella
Speotyto cunicularia hypugaea
Tyto alba pratincola
Chordeiles minor chapmani
Chordeiles minor howelli
Archilochus colubris
Chaetura pelagica
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos polyglottos
Mimus polyglottos leucopterus
Sialia sialis sialis
Corvus brachyrhynchos brachyrhynchos
Corvus brachyrhynchos paulus
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Progne subis subis
Geothlypis trichas trichas
Sturnella magna magna
Sturnella magna argutula
Sturnella neglecta neglecta
Agelaius phoeniceus predatorius
Icterus spurius
Quiscalus quiscula aeneus
Molothrus ater ater
Spizella pusilla pusilla
Chondestes grammacus strigatus
Spiza americana

Great Plains Upland Association.

This area, in northwestern Texas, includes the dry, level or rolling stretches of the Great Plains, exclusive of the vicinity of streams, lakes, and ponds. Its characteristic vegetation, in addition to the grass which more or less closely covers the ground, consists of numerous herbaceous flowering plants, scattered bushes and low cactuses, and stretches of "shin oak" (*Quercus gambelii*) and dwarf brush (*Artemisia filifolia*). The birds are those of grassy areas and other open places, but are as a whole of more western type than those on the eastern Texas prairies.

The important plants are:

Ephedra antisyphilitica
Agropyron smithii
Andropogon scoparius
Aristida fendleriana
Aristida havardii
Bouteloua curtipendula
Bouteloua gracilis
Bouteloua hirsuta
Cenchrus carolinianus
Eragrostis cilianensis
Eragrostis secundiflora
Festuca octoflora
Hilaria jamesii
Hordeum jubatum
Muhlenbergia pungens
Munroa squarrosa
Oryzopsis micrantha
Panicum hallii
Panicum obtusum
Panicum reverchonii
Panicum virgatum
Poa bigelovii
Schedonnardus paniculatus
Sporobolus auriculatus
Sporobolus cryptandrus
Sporobolus flexuosus
Sporobolus wrightii
Tridens albescens
Yucca glauca
Yucca stricta
Quercus gambelii
Persicaria persicarioides
Polygonum aviculare
Polygonum camporum
Polygonum erectum
Polygonum ramosissimum
Tiniaria convolvulus
Blitum capitatum
Chenopodium album
Paronychia dichotoma
Paronychia jamesii
Argemone platyceras
Acuan illinoensis
Mimosa biuncifera
Mimosa borealis
Morongia uncinata
Prosopis glandulosa
Hoffmannseggia jamesii
Amorpha canescens
Astragalus caryocarpus
Astragalus mollissimus
Parosela enneandra
Parosela formosa
Petalostemon purpureus
Psoralea digitata
Psoralea linearifolia
Linum rigidum
Polygala alba
Chamaesyce albomarginata
Chamaesyce fendleri
Chamaesyce lata
Chamaesyce nuttallii
Chamaesyce pilulifera
***Dichrophyllum** marginatum*
Schmaltzia trilobata
Glossopetalon spinescens
Zizyphus lycioides
Callirrhoe pedata
Echinocactus texensis
Echinocereus caespitosus
Echinocereus viridiflorus
Mamillaria missouriensis
Opuntia davisi
Opuntia leptocaulis
Opuntia macrorhiza
Nuttallia nuda
Anogra albicaulis
Anogra coronopifolia
Galpinsia hartwegii
Galpinsia lavandulaefolia
Galpinsia tubicula
Hartmannia speciosa
Meriolix intermedia
Oenothera biennis
Oenothera jamesii
Raimannia heterophylla
Asclepias latifolia
Asclepias tuberosa
Vincetoxicum productum
Convolvulus incanus
Evolvulus argenteus
Ipomoea leptophylla

Ipomoea longifolia
Phlox roemeriana
Verbena bipinnatifida
Verbena hastata
Verbena officinalis
Verbena stricta
Verbena xutha
Androcera rostrata
Datura stramonium
Cucurbita foetidissima
Achillea millefolium
Artemisia filifolia
Centaurea americana
Cirsium helleri
Cirsium megacephalum
Cirsium ochrocentrum
Gaillardia pulchella
Gutierrezia sarothrae
Helianthus annuus
Helianthus grosseserratus
Helianthus occidentalis
Helianthus orgyalis
Helianthus petiolaris
Helianthus rigidus
Laciniaria punctata
Ratibida columnifera
Rudbeckia hirta
Rudbeckia subtomentosa
Sideranthus spinulosus
Silphium laciniatum
Silphium speciosum
Solidago sparsiflora
Vernonia fasciculata
Vernonia interior

The birds inhabiting this association are:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria (R)
Planofalco mexicanus * (R)
Buteo borealis borealis
Buteo swainsoni
Buteo regalis † (R)
Aquila chrysaetos canadensis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Tympanuchus americanus attwateri (R)
Tympanuchus pallidicinctus
Callipepla squamata pallida
Colinus virginianus virginianus
Oxyechus vociferus vociferus
Podasocys montanus
Numenius americanus americanus
Zenaidura macroura marginella
Speotyto cunicularia hypugaea
Tyto alba pratincola (R)
Chordeiles minor howelli
Tyrannus tyrannus tyrannus
Muscivora forficata
Otocoris alpestris leucolaema
Otocoris alpestris enthymia
Mimus polyglottos leucopterus
Sialia sialis sialis
Salpinctes obsoletus obsoletus
Troglodytes aedon parkmanii (R)
Corvus brachyrhynchos brachyrhynchos
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis (R)
Petrochelidon albifrons albifrons
Progne subis subis
Sturnella magna magna
Sturnella neglecta neglecta
Xanthocephalus xanthocephalus
Euphagus cyanocephalus
Quiscalus quiscula aeneus
Molothrus ater ater
Nemospiza henslowii henslowii (R)

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* *Planofalco*, gen. nov.; type, and only species, *Falco mexicanus* Schlegel.

† =*Archibuteo ferrugineus.*

Ammodramus savannarum bimaculatus
Pooecetes gramineus confinis
Chondestes grammacus strigatus
Spiza americana
Calamospiza melanocorys
Passer domesticus domesticus
Carpodacus mexicanus frontalis (R)
Astragalinus tristis tristis (R)

Great Plains Riparian Association.

This comprises the stream valleys of the Great Plains region. Some of these are deep canyons, but most of them are only shallow valleys. Their typical vegetation is a fringe more or less sparse and intermittent, of trees and bushes, with a quota of herbaceous plants. The birds particularly attracted to these valleys are bush- or tree-dwelling species, together with, of course, those that are of genral distribution. The resultant combination is a fauna of considerably greater richness than that of the open plains.

The plants of this association are, in most important part, as follows:

Juniperus sabinoides
Typha latifolia
Carex stipata
Yucca glauca
Yucca stricta
Smilax glauca
Smilax hispida
Smilax rotundifolia
Populus deltoides
Salix nigra
Hicoria pecan
Juglans nigra
Juglans rupestris
Quercus gambelii
Quercus virginiana (R)
Celtis mississippiensis
Ulmus americana
Ulmus crassifolia
Morus rubra
Phoradendron flavescens
Atriplex canescens
Blitum capitatum
Chenopodium album
Cercocarpus montanus
Crataegus marshallii
Crataegus spathulata
Crataegus texana
Padus serotina
Prunus americana
Gleditsia triacanthos
Mimosa strigillosa
Prosopis glandulosa
Cercis canadensis
Amorpha canescens
Amorpha fruticosa
Ptelea mollis
Zanthoxylum clavaherculis
Rhoeidium microphyllum
Rhus lanceolata
Schmaltzia trilobata
Toxicodendron radicans
Zizyphus lycioides
Sapindus drummondii
Acer negundo
Cissus incisa
Parthenocissus quinquefolia
Vitis monticola
Opuntia leptocaulis
Opuntia macrorhiza
Nuttallia nuda
Cornus asperifolia
Bumelia lanuginosa
Fraxinus texensis
Fraxinus viridis

Asclepias tuberosa
Gonolobus albidus
Androcera rostrata
Datura stramonium
Achillea millefolium
Helianthus annuus
Vernonia fasciculata
Vernonia interior

The birds of this area consist of the following species:

Podilymbus podiceps podiceps
Nyctanassa violacea (R)
Nycticorax nycticorax naevius
Florida caerulea caerulea (R)
Leucophoyx thula thula (R)
Ardea herodias wardi
Ardea herodias treganzai
Mycteria americana (R)
Aix sponsa (R)
Spatula clypeata (R)
Querquedula discors (R)
Anas platyrhyncha platyrhyncha (R)
Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria deserticola
Planofalco mexicanus (R)
Buteo borealis borealis
Buteo lineatus alleni (R)
Buteo swainsoni
Buteo regalis (R)
Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetos canadensis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis
Elanoides forficatus forficatus (R)
Meleagris gallopavo silvestris
Callipepla squamata pallida
Colinus virginianus virginianus
Oxyechus vociferus vociferus
Numenius americanus americanus
Actitis macularia
Bartramia longicauda (R)
Himantopus mexicanus
Recurvirostra americana
Sternula albifrons antillarum
Zenaidura macroura marginella
Geococcyx californianus
Coccyzus americanus americanus
Colaptes auratus luteus
Centurus carolinus
Melanerpes erythrocephalus erythrophthalmus
Dryobates scalaris symplectus
Dryobates pubescens pubescens (R)
Dryobates villosus villosus
Streptoceryle alcyon alcyon
Bubo virginianus pallescens
Otus asio aikeni
Tyto alba pratincola
Phalaenoptilus nuttallii nuttallii
Chordeiles minor howelli
Horizopus richardsonii richardsonii
Empidonax traillii brewsteri
Sayornis sayus
Myiarchus cinerascens cinerascens
Myiarchus crinitus crinitus
Tyrannus verticalis
Tyrannus tyrannus tyrannus
Muscivora forficata
Toxostoma rufa longicauda
Mimus polyglottos leucopterus
Sialia sialis sialis
Polioptila caerulea caerulea
Catherpes mexicanus polioptilus
Salpinctes obsoletus obsoletus
Troglodytes aedon parkmanii (R)
Penthestes carolinensis agilis
Cyanocitta cristata bromia
Corvus brachyrhynchos brachyrhynchos
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo bellii bellii
Vireo griseus griseus
Vireosylva gilva gilva
Hirundo rustica erythrogastris
Riparia riparia riparia

Stelgidopteryx serripennis serripennis
Petrochelidon albifrons albifrons
Progne subis subis
Icteria virens longicauda
Geothlypis trichas occidentalis
Dendroica aestiva morcomi
Xanthocephalus xanthocephalus
Agelaius phoeniceus fortis
Icterus bullockii bullockii
Icterus galbula
Icterus spurius
Euphagus cyanocephalus
Quiscalus quiscula aeneus
Molothrus ater ater
Richmondena cardinalis cardinalis
Richmondena cardinalis magnirostris
Guiraca caerulea lazula
Passerina ciris pallidior
Spizella passerina passerina (R)
Amphispiza bilineata bilineata
Peucaea cassinii
Pooecetes gramineus confinis
Chondestes grammacus strigatus
Spiza americana
Astragalinus tristis tristis (R)

Great Plains Lacustrian Association.

This includes the lakes and ponds of the Great Plains. Many of these bodies of water are salt or alkaline, and have about their borders only a scanty growth of salt grass. Some of the fresh water ponds have well sodded shores, or in some cases a fringe of marsh. The vegetation is limited, and the influence of this paucity is evident in the scarcity of bird life.

The principal plants are:

Typha latifolia
Potomogeton pectinatus
Sagittaria latifolia
Sagittaria longiloba
Distichlis spicata
Carex stipata
Cyperus esculentus
Scirpus validus
Lemna minor
Spirodela polyrrhiza
Populus deltoides
Persicaria emersa
Castalia elegans
Tillaea drummondii

The birds frequenting these bodies of water are comprised in the following list:

Botaurus lentiginosus
Nycticorax nycticorax naevius
Florida caerulea caerulea (R)
Ardea herodias wardi
Ardea herodias treganzai
Mycteria americana (R)
Spatula clypeata (R)
Querquedula discors (R)
Anas platyrhyncha platyrhyncha (R)
Coragyps urubu urubu
Cathartes aura septentrionalis
Buteo swainsoni
Haliaeetus leucocephalus leucocephalus (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Fulica americana
Oxyechus vociferus vociferus
Podasocys montanus
Numenius americanus americanus

Actitis macularia
Himantopus mexicanus
Recurvirostra americana
Zenaidura macroura marginella
Streptoceryle alcyon alcyon
Otus asio aikeni
Chordeiles minor howelli
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos leucopterus
Corvus brachyrhynchos brachyrhynchos
Corvus cryptoleucus
Corvus corax sinuatus
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons albifrons
Progne subis subis
Xanthocephalus xanthocephalus
Agelaius phoeniceus fortis
Euphagus cyanocephalus
Quiscalus quiscula aeneus
Molothrus ater ater

Central Chaparral Association.

This is the area of chaparral, cedar brakes, and low oak woods on the uplands of the broken region in central and west central Texas, including the southern extension of the Upper Cross Timbers; but excluding the sometimes rather extensive open grassy areas. This chaparrel rarely develops into a tall forest, but is in many places dense, and clothes both hills and rolling lands. It forms thus an excellent cover for brush-dwelling birds.

The characteristics of the vegetation may be seen from the following list of plants:

Cheilanthes tomentosa
Pellaea flexuosa
Pellaea mucronata
Pinus cembroides
Juniperus sabinoides
Ephedra nevadensis
Dasylirion texanum
Nolina texana
Quamasia hyacinthina
Yucca glauca
Yucca rupicola
Yucca stricta
Yucca treculeana
Quercus brayi
Quercus breviloba
Quercus cinerea
Quercus durandi
Quercus fusiformus
Quercus laceyi
Quercus marylandica
Quercus palustris
Quercus schneckii
Quercus stellata
Quercus undulata
Quercus virginiana
Celtis occidentalis
Erigonum alatum
Atriplex canescens
Acleisanthes longiflora
Allionia linearis
Talinum lineare
Paronychia jamesii
Odostemon trifoliolatus
Delphinium carolinianum
Geum vernum
Prunus minutiflora
Acacia greggii
Acacia roemeriana
Acacia tortuosa
Acuan velutina
Mimosa biuncifera
Mimosa fragrans

Morongia uncinata
Prosopis glandulosa
Cassia pumilio
Cassia roemeriana
Cercis occidentalis
Hoffmannseggia densiflora (R)
Krameria secundiflora
Astragalus missouriensis
Astragalus wrightii
Broussonetia secundiflora
Eysenhardtia amorphoides
Indigofera leptosepala
Parosela formosa
Parosela frutescens
Parosela lasiathera
Psoralea cyphocalyx
Zornia bracteata
Linum multicaule
Linum rupestre
Covillea glutinosa (R)
Koeberlinia spinosa (R)
Ptelea mollis
Rutosma texanum
Zanthoxylum fruticosum
Polygala alba
Acalypha lindheimeri
Croton corymbulosus
Croton fruticulosus
Croton neomexicanus
Stillingia sylvatica
Tithymalopsis wrightii
Tragia nepetaefolia
Tragia nigricans
Rhoeidium microphyllum
Rhus lanceolata
Rhus virens
Schmaltzia trilobata
Ceanothus ovatus
Colubrina texensis
Condalia spathulata
Microrhamnus ericoides
Zizyphus obtusifolius
Ungnadia speciosa
Parthenocissus heptaphylla
Vitis cordefolia
Callirhoe digitata
Sida diffusa
Echinocactus texensis
Echinocereus caespitosus
Mamillaria heyderi
Mamillaria missouriensis
Opuntia arborescens (R)
Opuntia engelmanni
Opuntia leptocaulis
Opuntia lindheimeri
Gaura sinuata
Arbutus texana
Brayodendron texanum
Bumelia lanuginosa
Menodora heterophylla
Apocynum cannabinum
Vincetoxicum biflorum
Evolvulus pilosus
Gilia rigidula
Coldenia canescens
Lippia ligustrina
Hedeoma reverchonii
Salvia farinacea
Scutellaria resinosa
Lycium berlandieri
Lycium carolinianum
Castilleja lindheimeri
Pentstemon guadalupensis
Ibervillea lindheimeri
Ibervillea tripartita
Campanula reverchonii
Lygodesmia aphylla
Aciphyllaea acerosa
Amblyolepis setigera
Berlandiera lyrata
Flourensia cernua
Gaillardia simplex
Gymnolomia tenuifolia
Laphamia halimifolia
Machaeranthera tanacetifolia
Melampodium leucanthum
Psilostrophe tagentinae
Tetragonotheca texana
Thelesperma ambiguum
Thelesperma subsimplicifolium
Thymophylla pentachaeta

Its birds are as follows:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Polyborus cheriway auduboni
Buteo borealis borealis
Buteo lineatus alleni
Buteo albonotatus albonotatus
Buteo swainsoni
Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetos canadensis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis (R)
Meleagris gallopavo intermedia (R)
Cyrtonyx montezumae mearnsi
Callipepla squamata pallida
Colinus virginianus texanus
Sardafella inca (R)
Zenaidura macroura marginella
Geococcyx californianus
Coccyzus americanus americanus
Centurus aurifrons
Centurus carolinus
Balanosphyra formicivora formicivora (R)
Melanerpes erythrocephalus erythrocephalus
Phloeotomus pileatus pileatus
Chordeiles minor aserriensis
Chordeiles minor howelli
Archilochus alexandri
Archilochus colubris
Horizopus virens
Empidonax traillii brewsteri (R)
Empidonax minimus (R)
Myiarchus cinerascens cinerascens
Myiarchus crinitus crinitus
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos leucopterus
Sialia sialis sialis
Polioptila caerulea caerulea
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Heleodytes brunneicapillus couesi
Sitta carolinensis carolinensis (=*aikeni*)
Sitta carolinensis cookei
Penthestes carolinensis agilis
Baeolophus atricristatus sennetti
Baeolophus bicolor
Cyanocitta cristata cristata (=*florincola*)
Cyanocitta cristata bromia
Aphelocoma californica texana
Corvus brachyrhynchos brachyrhynchos
Corvus brachyrhynchos paulus
Corvus cryptoleucus (R)
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo bellii bellii
Vireo griseus griseus
Vireo atricapillus
Lanivireo flavifrons
Hirundo rustica erythrogastris
Icteria virens virens
Dendroica chrysoparia
Dendroica aestiva aestiva (R)
Xanthocephalus xanthocephalus (R)
Icterus bullockii bullockii
Icterus spurius
Quiscalus quiscula aeneus
Molothrus ater ater
Molothrus ater obscurus
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina ciris pallidior
Passerina amoena
Passerina cyanea
Pipilo fuscus mesoleucus
Spizella pusilla pusilla
Spizella passerina passerina
Amphispiza bilineata bilineata
Peucaea cassinii
Aimophila ruficeps eremoeca

Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Astragalimus psaltria psaltria

Central Riparian Association.

This comprises the stream valleys and canyons of the central broken region, and includes the edges of the Edwards Plateau. These in most cases support a rich distinctive plant growth, more arboreal in character than that of the upland chaparral, and as a consequence they attract a different assemblage of birds. This area is, like the chaparral, an excellent place for birds, and the list is comparatively a long one.

The principal plants are:

Botrychium virginianum
Adiantum capillusveneris
Dryopteris normalis
Pellaea atropurpurea
Woodsia obtusa
Juniperus sabinoides
Taxodium distichum
Typha latifolia
Arisaema dracontium
Tillandsia recurvata
Dasylirion texanum
Yucca glauca
Yucca rupicola
Smilax bonanox
Smilax rotundifolia
Populus deltoides
Salix nigra
Hicoria myristicaeformis
Hicoria pecan
Juglans rupestris
Quercus brayi
Quercus macrocarpa
Quercus muhlenbergii
Quercus nigra
Quercus texana
Quercus virginiana
Celtis mississippiensis
Celtis occidentalis
Ulmus americana
Ulmus crassifolia
Ulmus pubescens
Morus rubra
Phoradendron flavescens
Aristolochia longifolia
Portulaca lanceolata
Talinum calycinum
Talinum lineare
Mollugo cerviana
Aquilegia canadensis
Clematis drummondii
Delphinium carolinianum
Odostemon trifoliolatus
Benzoin aestivale
Lesquerella densiflora
Platanus occidentalis
Sedum torreyi
Rosa arkansana
Rosa foliolosa
Crataegus texana
Malus coronaria
Padus serotina
Prunus rivularis
Acacia roemeriana
Leucaena retusa
Morongia uncinata
Prosopis glandulosa
Cercis occidentalis
Amorpha fruticosa
Eysenhardtia amorphoides
Sophora affinis
Kallstroemia maxima
Ptelea mollis
Zanthoxylum fruticosum
Croton corymbulosus

Stillingia dentata
Cotinus cotinoides
Rhus lanceolata
Rhus virens
Schmaltzia crenata
Toxicodendron radicans
Ilex decidua
Sapindus drummondi
Ungnadia speciosa
Ceanothus ovatus
Rhamnus caroliniana
Aesculus octandra
Parthenocissus quinquefolia
Vitis candicans
Vitis cordifolia
Tilia americana
Sida physocalyx
Sphaeralcea cuspidata
Opuntia engelmanni
Gaura sinuata
Gaura suffulta
Hartmannia speciosa
Cornus asperifolia
Arbutus texana
Brayodendron texanum
Bumelia lanuginosa
Bumelia lycioides
Forestiera neomexicana
Fraxinus viridis
Menodora heterophylla
Marilaunidium hispidum
Cryptanthe texana
Lappula occidentalis
Lippia ligustrina
Lycium carolinianum
Nicotiana glauca
Quincula lobata
Solanum elaeagnifolium
Martynia louisiana
Cephalanthus occidentalis
Lonicera albiflora
Lonicera sempervirens
Symphoricarpos symphoricarpos
Viburnum prunifolium
Cucurbita foetidissima
Ibervillea lindheimeri
Ibervillea tripartita
Xanthium canadense
Berlandiera lyrata
Helianthus giganteus
Machaeranthera tanacetifolia
Senecio aureus

The list of birds is as follows:

Nycticorax nycticorax naevius
Butorides virescens virescens
Florida caerulea caerulea
Leucophoyx thula thula (R)
Casmerodius alba egretta (R)
Ardea herodias wardi
Mycteria americana (R)
Aix sponsa (R)
Spatula clypeata (R)
Querquedula discors
Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Polyborus cheriway
Buteo borealis borealis
Buteo lineatus alleni
Buteo albonotatus albonotatus
Buteo swainsoni
Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetos canadensis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis
Elanoides forficatus forficatus (R)
Pandion haliaetus carolinensis (R)
Meleagris gallopavo intermedia
Cyrtonyx montezumae mearnsi
Callipepla squamata pallida
Colinus virginianus texanus
Fulica americana (R)
Oxyechus vociferus vociferus
Actitis macularia
Scardafella inca (R)
Zenaidura macroura marginella
Geococcyx californianus
Coccyzus americanus americanus

Coccyzus americanus occidentalis
Centurus aurifrons
Centurus carolinus
Balanosphyra formicivora formicivora (R)
Melanerpes erythrocephalus erythrocephalus
Phloeotomus pileatus pileatus
Dryobates scalaris symplectus
Dryobates pubescens pubescens
Chloroceryle americana septentrionalis
Streptoceryle alcyon alcyon
Bubo virginianus pallescens
Otus asio hasbroucki
Strix varia helveola
Tyto alba pratincola
Antrostomus carolinensis
Phalaenoptilus nuttallii nuttallii
Chordeiles minor aserriensis
Chordeiles minor howelli
Archilochus alexandri
Archilochus colubris
Horizopus virens
Empidonax virescens
Empidonax traillii brewsteri
Empidonax minimus (R)
Sayornis phoebe
Sayornis nigricans semiater
Myiarchus cinerascens cinerascens
Myiarchus crinitus crinitus
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos leucopterus
Sialia sialis sialis
Polioptila caerulea caerulea
Catherpes mexicanus polioptilus
Salpinctes obsoletus obsoletus
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Heleodytes bruneicapillus couesi
Sitta carolinensis carolinensis (=*aikeni*)
Sitta carolinensis cookei
Penthestes carolinensis agilis
Baeolophus atricristatus sennetti
Baeolophus bicolor
Cyanocitta cristata cristata (=*florincola*)
Aphelocoma californica texana
Corvus brachyrhynchos brachyrhynchos
Corvus brachyrhynchos paulus
Corvus cryptoleucus (R)
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo bellii bellii
Vireo griseus griseus
Vireo atricapillus
Lanivireo flavifrons
Vireosylva olivacea
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons albifrons
Petrochelidon albifrons tachina
Petrochelidon fulva pallida (R)
Progne subis subis
Icteria virens virens
Oporornis formosus
Dendroica dominica albilora
Dendroica chrysoparia
Dendroica aestiva aestiva (R)
Compsothlypis americana ramalinae
Mniotilta varia
Xanthocephalus xanthocephalus
Agelaius phoeniceus predatorius (R)
Icterus bullockii bullockii
Icterus spurius
Quiscalus quiscula aeneus
Molothrus ater ater
Molothrus ater obscurus
Piranga rubra rubra
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina ciris pallidior
Passerina amoena
Passerina cyanea
Pipilo fuscus mesoleucus
Spizella pusilla pusilla
Spizella passerina passerina
Amphispiza bilineata bilineata

Peucaea cassinii
Aimophila ruficeps eremoeca
Chondestes grammacus strigatus
Spiza americana
Astragalinus psaltria psaltria

Central Grass Association.

The grassy and other open areas on the uplands of the central broken region of the State have a distinctive though less striking fauna and flora. The vegetation consists principally of grasses and flowering herbaceous plants, and includes a few scattered cactuses. The birds are prairie inhabiting or open land species.

The most characteristic plants are included in the following list:

Andropogon emersus
Aristida bromoides
Aristida lanosa
Aristida oligantha
Bouteloua eriopoda
Bouteloua hirsuta
Bouteloua texana
Bouteloua trifida
Chaetochloa geniculata
Chaetochloa macrostachya
Chloris cucullata
Chloris verticillata
Eragrostis curtipedicellata
Eragrostis pectinacea
Eragrostis refracta
Eragrostis sessilispica
Erianthus contortus
Eriochloa sericea
Festuca sciurea
Gymnopogon ambiguus
Hilaria cenchroides
Holcus halapensis
Hordeum jubatum
Hordeum pusillum
Leptochloa nealleyi
Limnodea arkansana
Melica mutica
Melica porteri
Muhlenbergia capillaris
Panicum ciliatissimum
Panicum dichotomiflorum
Panicum fasciculatum reticulatum
Panicum filipes
Panicum hallii
Panicum helleri
Panicum lindheimeri
Panicum pedicellatum
Panicum perlongum
Panicum plenum
Panicum ramisetum
Panicum reverchoni
Panicum texanum
Panicum virgatum
Poa arachnifera
Schedonnardus paniculatus
Sitanion hystrix
Sorghastrum nutans
Sphenopholis hallii
Sphenopholis interrupta
Sphenopholis obtusata
Sphenopholis pallens longiflora
Sporobolus argutus
Stipa leucotricha
Trichloris pluriflora
Tridens avenaceus
Tridens strictus
Tridens texanus
Nolina texana
Quamasia hyacinthina
Yucca glauca
Yucca stricta
Acleisanthes longiflora
Delphinium macroceratilis
Delphinium vimineum
Ranunculus cuneiformis
Ranunculus macranthus

Argemone platyceras
Lesquerella gordoni
Lesquerella gracilis
Lesquerella sessilis
Acuan velutina
Morongia uncinata
Cassia pumilio
Astragalus missouriensis
Astragalus nuttallianus
Indigofera leptosepala
Lupinus subcarnosus
Psoralea cuspidata
Parosela lasiathera
Zornia bracteata
Linum multicaule
Linum rigidum
Ionoxalis vespertilionis
Kallstroemia maxima
Rutosma texanum
Chamaesyce lata
Croton corymbulosus
Tragia neptaefolia
Callirrhoe digitata
Callirrhoe involucrata
Sida physocalyx
Echinocactus texensis
Echinocereus caespitosus
Mamillaria heyderi
Mamillaria missouriensis
Mentzelia oligosperma
Gaura coccinea
Gaura sinuata
Hartmannia speciosa
Megapterium missouriense
Pentstemon acuminatus
Meriolix serrulata
Raimannia laciniata
Apocynum cannabinum
Asclepias longicornu
Asclepiodora decumbens
Vincetoxicum biflorum
Pentstemon cobaea
Pentstemon grandiflorus
Penstemon helleri
Lygodesmia aphylla
Pinaropappus roseus
Convolvulus incanus
Galia acerosa
Phlox drummondii
Coldenia canescens
Verbena bipinnatifida
Verbena hastata
Verbena officinalis
Verbena xutha
Hedeoma lata
Hedeoma nana
Melosmon laciniatum
Monarda citriodora
Salvia farinacea
Salvia texana
Scutellaria resinosa
Quincula lobata
Solanum elaeagnifolium
Solanum torreyi
Castilleja lindheimeri
Amblyolepis setigera
Aphanostephus ramosissimus
Centaurea americana
Cirsium discolor
Crassina grandiflora
Encelia calva
Gaillardia pinnatifida
Gaillardia pulchella
Gaillardia simplex
Hymenoxys odorata
Machaeranthera tanacetifolia
Parthenium lyratum
Ratibida pulchella
Sideranthus spinulosus
Tetraneuris scaposa
Thelesperma subsimplicifolium

The birds found here are as follows:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Polyborus cheriway audubonii
Buteo borealis borealis
Buteo lineatus alleni
Buteo albonotatus albonotatus
Buteo swainsoni
Haliaeetus leucecephalus leucocephalus (R)

Aquila chrysaetos canadensis (R)
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Meleagris gallopavo intermedia
Tympanuchus americanus attwateri
Cyrtonyx montezumae mearnsi
Callipepla squamata pallida
Colinus virginianus texanus
Oxyechus vociferus vociferus
Scardafella inca (R)
Zenaidura macroura marginella
Geococcyx californianus
Speotyto cunicularia hypugaea
Otus asio hasbroucki
Strix varia helveola
Tyto alba pratincola
Phalaenoptilus nuttallii nuttallii (R)
Chordeiles minor aserriensis
Chordeiles minor howelli
Archilochus colubris
Tyrannus tyrannus tyrannus
Muscivora forficata
Mimus polyglottos leucopterus
Sialia sialis sialis
Corvus brachyrhynchos brachyrhynchos
Corvus brachyrhynchos paulus
Corvus cryptoleucus (R)
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons albifrons
Petrochelidon albifrons tachina
Progne subis subis
Sturnella magna magna
Sturnella magna hoopesi
Sturnella neglecta neglecta
Icterus bullockii bullockii
Icterus spurius
Quiscalus quiscula aeneus
Molothrus ater ater
Molothrus ater obscurus
Guiraca caerulea lazula (R)
Passerina ciris pallidior (R)
Passerina amoena (R)
Passerina cyanea
Pipilo fuscus mesoleucus
Spizella pusilla pusilla
Spizella passerina passerina
Aimophila ruficeps eremoeca
Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Passer domesticus domesticus
Astragalinus psaltria psaltria

Southern Brush Association.

This consists of the chaparral areas of central southern Texas, south and southeast of the Edwards Plateau, exclusive of the stream valleys and the open grassy tracts. This chaparral grows on level or rolling land, and varies from a low straggling semi-arid growth to a very dense jungle, though not to any extent taking an arboreal character. It is made up of a great variety of shrubs and low trees, many of them thorny; together with cactuses, yuccas, agaves, and some flowering herbaceous plants. Owing to the character of its vegetation, and to a less extent its geographical position, this association forms one of the most attractive places for birds to be found in the State, and the total number of spe-

cies occurring here is correspondingly large. Thicket dwelling birds, of course, predominate.

The facies of the vegetation is evident from the subjoined list of plants.

Ephedra nevadensis
Cenchrus carolinianus
Commelina crispa
Tillandsia baileyi
Tillandsia recurvata
Yucca arkansana
Yucca rupicola
Yucca treculeana
Smilax bonanox
Agava rigida
Manfreda maculosa
Manfreda virginica
Cerothamnus cerifera
Quercus minor
Quercus virginiana
Momisia pallida
Phoradendron flavescens
Nyctaginia capitata
Odostemon trifoliolatus
Delphinium carolinianum
Persea borbonia
Argemone mexicana
Argemone platyceras
Argemone rosea
Sedum texanum
Acacia amentacea
Acacia berlandieri
Acacia constricta
Acacia greggii
Acacia roemeriana
Acacia tortuosa
Acacia wrightii
Leucaena glauca
Leucaena retusa
Mimosa berlandieri
Mimosa fragrans
Mimosa lindheimeri
Mimosa malacophylla
Mimosa texana
Morongia latidens
Morongia roemeriana
Morongia uncinata
Prosopis glandulosa
Vachellia farnesiana
Cercidium floridum
Cercidium texanum
Parkinsonia aculeata
Broussonetia secundiflora
Coursetia axillaris
Eysenhardtia amorphoides
Parosela domingensis
Parosela formosa
Parosela lasiathera
Parosela laxiflora
Parosela nana
Covillea glutinosa
Guaiacum sanctum
Porlieria angustifolia
Zanthoxylum fagara
Koeberlinia spinosa
Castela nicholsonii
Bernardia myricaefolia
Rhoeidium microphyllum
Schaefferia cuneifolia
Colubrina texensis
Condalia obovata
Karwinskia humboldtiana
Microrhamnus ericoides
Rhamnus caroliniana
Zizyphus obtusifolius
Callirhoe pedata
Malvastrum tricuspidatum
Malvastrum wrightii
Echinocactus brevihamatus
Echinocactus sinuatus
Echinocactus texensis
Echinocactus wrightii
Echinocereus caespitosus
Echinocereus enneacanthus
Echinocereus poselgeri
Echinocereus stramineus
Mamillaria calcarata
Mamillaria heyderi
Mamillaria meiacantha
Mamillaria missouriensis
Mamillaria radiosa

Mamillaria sphaerica
Mamillaria texana
Opuntia arborescens
Opuntia engelmanni
Opuntia leptocaulis
Gaura brachycarpa
Gaura sinuata
Batodendron arboreum
Brayodendron texanum
Bumelia lanuginosa
Forestiera angustifolia
Eustoma russellianum
Phlox drummondii
Ehretia elliptica
Lithospermum matamorense
Lantana camara
Lippia ligustrina
Verbena ciliata
Lycium carolinianum
Nicotiana trigonophylla
Solanum elaeagnifolium
Solanum triquetrum
Castilleja indivisa
Castilleja lindheimeri
Leucophyllum texanum
Ibervillea lindheimeri
Centaurea americana
Coreopsis nuecensis
Helianthus annuus
Helianthus cucumerifolius
Ratibida columifera

The list of birds follows:

Dendrocygna autumnalis
Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Rhynchofalco fuscocoerulescens septentrionalis
Polyborus cheriway auduboni
Buteo borealis borealis
Buteo lineatus alleni
Buteo lineatus texanus
Buteo albonotatus albonotatus
Buteo swainsoni
Buteo platypterus platypterus (R)
Tachytriorchis albicaudatus sennetti
Urubitinga anthracina (R)
Haliaeetus leucocephalus leucocephalus (R)
Parabuteo unicinctus harrisi
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis
Elanus leucurus majusculus (R)
Elanoides forficatus forficatus (R)
Ortalis vetula vetula
Meleagris gallopavo intermedia
Callipepla squamata castanogastris
Colinus virginianus texanus
Chaemepelia passerina pallescens
Scardafella inca
Zenaidura macroura marginella
Melopelia asiatica asiatica
Leptotila fulviventris angelica
Chloroenas flavirostris flavirostris
Crotophaga sulcirostris sulcirostris
Geococcyx californianus
Coccyzus americanus americanus
Centurus aurifrons
Centurus carolinus
Phloeotomus pileatus pileatus (R)
Dryobates scalaris symplectus
Glaucidium brasilianum ridgwayi
Speotyto cunicularia hypugaea
Bubo virginianus virginianus
Bubo virginianus pallescens
Otus asio mccallii
Strix varia helveola
Tyto alba pratincola
Antrostomus carolinensis
Phalaenoptilus nuttalli nuttallii
Nyctidromus albicollis merrilli
Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Amazilia yucatanensis chalconota
Camptostoma imberbe
Pyrocephalus rubinus mexicanus

Horizopus virens
Empidonax minimus (R)
Myiarchus cinerascens cinerascens
Myiarchus magister nelsoni
Myiarchus crinitus crinitus
Pitangus sulphuratus derbianus
Muscivora forficata
Toxostoma curvirostris curvirostris
Toxostoma longirostris sennetti
Mimus polyglottos leucopterus
Sialia sialis sialis (R)
Sialia sialis episcopus
Polioptila melanura
Polioptila caerulea caerulea
Polioptila caerulea obscura
Salpinctes obsoletus obsoletus (R)
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Thryothorus ludovicianus lomitensis
Heleodytes brunneicapillus couesi
Auriparus flaviceps flaviceps
Penthestes carolinensis agilis
Baeolophus atricristatus atricristatus
Baeolophus atricristatus sennetti
Baeolophus bicolor
Xanthoura luxuosa glaucescens
Corvus brachyrhynchos paulus (R)
Corvus cryptoleucus
Lanius ludovicianus exubitorides
Vireo bellii bellii
Vireo griseus griseus
Vireo griseus micrus
Lanivireo flavifrons (R)
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Progne subis subis
Icteria virens virens
Icteria virens longicauda
Chamaethlypis poliocephala poliocephala
Geothlypis trichas trichas
Dendroica aestiva aestiva (R)
Icterus bullockii bullockii
Icterus cucullatus sennettii
Icterus melanocephalus audubonii
Icterus spurius
Megaquiscalus major macrourus
Quiscalus quiscula aeneus
Molothrus ater obscurus
Tangavius aeneus involucratus
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Arremonops rufivirgatus rufivirgatus
Amphispiza bilineata bilineata
Peucaea cassinii
Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Astragalinus psaltria psaltria

Southern Riparian Association.

In this are included the stream valleys and ponds of the great southern chaparral belt of central southern Texas. The streams are mostly fringed, and the ponds more or less surrounded, in addition to thickets, by considerable arboreal vegetation, but sometimes this is entirely lacking. But even the herbaceous growth, composed as it is in material part of hydrophilous species, gives a distinctive tone to this association. The arboreal and hydrophytic character of the vege-

tation has its direct influence here on the bird life, as an examination of the list of species will show.

The plants of this area are as follows:

Usnea barbata
Typha latifolia
Sagittaria platyphylla.
Arundinaria macrosperma
Arundo donax
Bromus unioloides
Bulbilis dactyloides
Cenchrus carolinianus
Cenchrus echinatus
Chaetochloa setosa
Dactyloctenium aegyptium
Eleusine indica
Eragrostis capillaris
Eriochloa punctata
Holcus halapensis
Limnodea arkansana
Paspalum distichum
Phragmites phragmites
Sphenopholis obtusata
Sporobolus buckleyi
Sporobolus wrightii
Syntherisma sanguinalis
Cyperus articulatus
Cyperus buckleyi
Cyperus cyrtolepis
Cyperus erythrorhizos
Cyperus fendlerianus
Cyperus flavescens
Cyperus haspan
Cyperus ochraceus
Cyperus surinamensis
Scirpus validus
Sabal mexicana
Dendropogon usneoides
Tillandsia baileyi
Tillandsia recurvata
Yucca treculeana
Smilax bonanox
Manfreda variegata
Populus deltoides
Salix nigra
Hicoria pecan
Quercus virginiana
Celtis occidentalis
Momisia pallida
Ulmus americana
Ulmus crassifolia
Phoradendron flavescens
Mirabilis wrightiana
Quamoclidion multiflorum
Nelumbo lutea
Nymphaea advena
Nymphaea microcarpa
Nymphaea ovata
Clematis drummondii
Halerpestes cymbalaria
Ranunculus macranthus
Argemone mexicana
Argemone platyceras
Argemone rosea
Lesquerella lasiocarpa
Platanus occidentalis (R)
Fallugia paradoxa
Padus serotina (R)
Havardia brevifolia
Prosopis glandulosa
Vachellia farnesiana
Parkinsonia aculeata
Broussonetia secundiflora
Daubentonia longifolia
Ptelea mollis
Rhamnus caroliniana
Sapindus drummondii
Vitis candicans
Vitis cinerea
Callirrhoe geranioides
Callirrhoe involucrata
Heimia salicifolia
Echinocereus berlandieri
Echinocereus dubius
Echinocereus procumbens
Opuntia engelmanni
Opuntia leptocaulis
Bumelia lanuginosa
Forestiera angustifolia
Fraxinus berlandieri
Phlox villosissima
Ehretia elliptica

Lippia ligustrina
Datura meteloides
Nicotiana repanda
Leucophyllum texanum
Ruellia tuberosa
Tetramerium platystegium
Sambucus mexicana
Ibervillea lindheimeri
Ibervillea tenuisecta
Baccharis glutinosa
Helenium amphibolum
Helenium autumnale
Helenium elegans
Helenium microcephalum
Helenium ooclinum
Helenium tenuifolium
Helianthus annuus
Helianthus ciliaris
Helianthus petiolaris
Isocoma drummondii
Stanfieldia nealleyi
Varilla texana

The birds occurring here are even more numerous than those of the dense upland chaparral, and are given in the following list:

Podilymbus podiceps podiceps
Colymbus dominicus brachypterus
Ixobrychus exilis exilis (R)
Botaurus lentiginosus (R)
Nycticorax nycticorax naevius
Butorides virescens virescens
Florida caerulea caerulea
Hydranassa tricolor ruficollis
Leucophoyx thula thula
Casmerodius alba egretta
Ardea herodias wardi
Mycteria americana
Nomonyx dominicus (R)
Aix sponsa (R)
Spatula clypeata (R)
Querquedula discors (R)
Dendrocygna autumnalis
Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Rhynchofalco fuscocoerulescus septentrionalis (R)
Polyborus cheriway auduboni
Buteo borealis borealis
Buteo lineatus alleni
Buteo lineatus texanus
Buteo albonotatus albonotatus
Buteo swainsoni
Buteo platypterus platypterus (R)
Tachytriorchis albicaudatus sennetti
Urubitinga anthracina (R)
Haliaeetus leucocephalus leucocephalus (R)
Parabuteo unicinctus harrisi
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis
Elanus leucurus majusculus (R)
Elanoides forficatus forficatus (R)
Pandion haliaetus carolinensis (R)
Ortalis vetula vetula
Meleagris gallopavo intermedia
Callipepla squamata castanogastris
Colinus virginianus texanus
Fulica americana
Gallinula chloropus cachinnans (R)
Porphyrula martinica
Asarcia spinosa gymnostoma (R)
Oxyechus vociferus vociferus
Chaemepelia passerina pallescens
Scardafella inca
Zenaidura macroura marginella
Melopelia asiatica asiatica
Leptotila fulviventris angelica
Chloroenas flavirostris flavirostris
Crotophaga sulcirostris sulcirostris
Geococcyx californianus
Coccyzus americanus americanus
Centurus aurifrons
Centurus carolinus

Phloeotomus pileatus pileatus
Dryobates scalaris symplectus
Chloroceryle americana septentrionalis
Streptoceryle alcyon alcyon
Micropallas whitneyi idonea (R)
Glaucidium brasilianum ridgwayi
Bubo virginianus virginianus
Bubo virginianus pallescens
Otus asio mccallii
Strix varia helveola
Tyto alba pratincola
Antrostomus carolinensis
Phalaenoptilus nuttallii nuttallii
Nyctidromus albicollis merrilli
Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Amazilia yucatanensis chalconota
Camptostoma imberbe
Pyrocephalus rubinus mexicanus
Horizopus virens
Empidonax virescens
Empidonax minimus (R)
Myiarchus cinerascens cinerascens
Myiarchus magister nelsoni
Myiarchus crinitus crinitus
Pitangus sulphuratus derbianus
Tyrannus melancholicus couchii
Muscivora forficata
Toxostoma curvirostris curvirostris
Toxostoma longirostris sennetti
Mimus polyglottos leucopterus
Sialia sialis sialis (R)
Sialia sialis episcopus (R)
Polioptila melanura
Polioptila caerulea caerulea
Polioptila caerulea obscura
Salpinctes obsoletus obsoletus (R)
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Thryothorus ludovicianus lomitensis
Heleodytes brunneicapillus couesi
Auriparus flaviceps flaviceps
Penthestes carolinensis agilis
Baeolophus atricristatus atricristatus
Baeolophus atricristatus sennetti
Baeolophus bicolor
Xanthoura luxuosa glaucescens
Corvus brachyrhynchos paulus (R)
Corvus cryptoleucus
Lanius ludovicianus excubitorides
Vireo bellii bellii
Vireo griseus griseus
Vireo griseus micrus
Lanivireo flavifrons (R)
Vireosylva olivacea
Hirundo rustica erythrogastris
Riparia riparia riparia
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons tachina
Progne subis subis
Icteria virens virens
Icteria virens longicauda
Chamaethlypis poliocephala poliocephala
Geothlypis trichas trichas
Dendroica dominica albilora
Dendroica aestiva aestiva (R)
Compsothlypis pitiayumi nigrilora
Compsothlypis americana ramalinae (R)
Agelaius phoeniceus megapotamus
Icterus bullockii bullockii
Icterus cucullatus sennettii
Icterus melanocephalus audubonii
Icterus spurius
Megaquiscalus major macrourus
Quiscalus quiscula aeneus
Molothrus ater obscurus
Tangavius aeneus involucratus
Piranga rubra rubra
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Sporophila morelleti sharpei
Arremonops rufivirgatus rufivirgatus

Amphispiza bilineata bilineata
Peucaea cassinii
Chondestes grammacus strigatus
Spiza americana
Carpodacus mexicanus frontalis
Astragalinus psaltria psaltria

Southern Grass Association.

Scattered through the chaparral of the central and southern region of the State are many openings or small prairies, most of them grassy and supporting as well a growth of flowering annuals and other herbaceous plants, but lacking either bushes or trees. The birds of these grassy areas are fewer in number than those of the chaparral itself, and are terrestrial species of the open grass land, the brush dwelling and strictly arboreal species being absent, together with nearly all water-fowl and shore-birds.

The conspicuous plants appear in the following list:

Andropogon emersus
Andropogon tener
Bouteloua barbata
Bouteloua hirsuta
Bouteloua trifida
Cenchrus carolinianus
Chaetochloa geniculata
Chaetochloa gracilis
Chaetochloa macrostachya
Chloris cucullata
Chloris petraea
Chloris texana
Chloris verticillata
Distichlis multinervosa
Elyonurus tripsacoides
Erianthus divaricatus
Hilaria mutica
Holcus halapensis
Manisuris cylindrica
Manisuris fasciculata
Nazia aliena
Panicum capillarioides
Panicum ciliatissimum
Panicum fasciculatum reticulatum
Panicum filipes
Panicum firmulum
Panicum hallii
Panicum ramisetum
Panicum reverchoni
Panicum texanum
Paspalum laeve
Sorghastrum nutans
Tridens albescens
Tridens buckleyanus
Tridens congestus
Tripsacum floridanum
Commelina crispa
Tradescantia gigantea
Tradescantia micrantha
Allium mutabile
Yucca arkansana
Agave rigida
Manfreda maculosa
Manfreda virginica
Nemastylis coelestina
Allionia coccinea
Mirabilis jalapa
Nyctaginia capitata
Argemone mexicana
Argemone platyceras
Argemone rosea
Arabis petiolaris
Lesquerella argyrea
Lesquerella gracilis
Lesquerella sessilis
Synthlipsis berlandieri
Morongia uncinata
Chamaecrista procumbens
Krameria secundiflora
Astragalus brazoensis
Astragalus leptocarpus
Astragalus nuttallianus

Baptisia leucophaea
Cracca lindheimeri
Daubentonia longifolia
Galactia canescens
Galactia marginalis
Indigofera leptosepala
Lupinus subcarnosus
Parosela lasiathera
Psoralea cuspidata
Psoralea floribunda
Psoralea rhombifolia
Zornia tetraphylla
Linum rigidum
Acalypha radians
Cnidoscolus stimulosus
Stillingia sylvatica
Callirrhoe linearilobа
Callirrhoe pedata
Phaeralcea lindheimeri
Echinocactus texensis
Echinocereus caespitosus
Echinocereus enneacanthus
Echinocereus stramineus
Mamillaria calcarata
Mamillaria heyderi
Mamillaria meiacantha
Mamillaria missouriensis
Mamillaria radiosa
Mamillaria texana
Gaura coccinea
Gaura drummondii
Gaura suffulta
Gaura tripetala
Hartmannia speciosa
Hartmannia tetraptera
Meriolix serrulata drummondii
Centaurium calycosum
Asclepias longicornu
Asclepiodora decumbens
Convolvulus hermannioides
Evolvulus sericeus
Phlox drummondii
Lantana camara
Verbena bipinnatifida
Verbena canescens
Verbena ciliata
Verbena urticaefolia
Verbena xutha
Monarda citriodora
Scutellaria drummondii
Nicotiana trigonophylla
Solanum elaeagnifolium
Afzelia texana
Aphanostephus skirrobasis
Centaurea americana
Coreopsis cardaminefolia
Coreopsis drummondii
Coreopsis grandiflora
Coreopsis nuecensis
Engelmannia pinnatifida
Filago nivea
Gaillardia amblyodon
Gaillardia lanceolata
Gaillardia pinnatifida
Gaillardia pulchella
Grindelia microcephala
Grindelia squarrosa
Helenium autumnale
Helenium microcephalum
Helenium tenuifolium
Isopappus divaricatus
Ratibida columnifera
Ratibida peduncularis
Rudbeckia hirta
Stevia foliosa
Verbesina encelioides

The birds are included in the following list:

Polyborus cheriway auduboni
Buteo borealis borealis
Buteo albonotatus albonotatus
Buteo swainsoni
Tachytriorchis albicaudatus sennetti
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Ictinia misisippiensis
Elanus leucurus majusculus (R)
Elanoides forficatus forficatus (R)
Meleagris gallopavo intermedia
Tympanuchus americanus attwateri
Colinus virginianus texanus

Callipepla squamata castanogastris
Oxyechus vociferus vociferus
Chaemepelia passerina pallescens
Scardafella inca
Zenaidura macroura marginella
Melopelia asiatica asiatica (R)
Crotophaga sulcirostris sulcirostris (R)
Geococcyx californianus
Speotyto cunicularia hypugaea
Otus asio mccallii
Strix varia helveola
Tyto alba pratincola
Phalaenoptilus nuttallii nuttallii
Nyctidromus albicollis merrilli
Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Muscivora forficata
Mimus polyglottos leucopterus
Sialia sialis sialis (R)
Sialia sialis episcopus (R)
Baeolophus atricristatus sennetti
Corvus brachyrhynchos paulus (R)
Corvus cryptoleucus
Lanius ludovicianus excubitorides
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons tachina
Progne subis subis
Sturnella magna hoopesi
Icterus bullockii bullockii
Icterus cucullatus sennetti
Icterus spurius
Megaquiscalus major macrourus
Quiscalus quiscula aeneus
Molothrus ater obscurus
Tangavius aeneus involucratus
Guiraca caerulea lazula (R)
Passerina ciris pallidior
Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Passer domesticus domesticus
Carpodacus mexicanus frontalis (R)
Astragalinus psaltria psaltria

Desert Chaparral Association.

The Desert Chaparral Association comprises the chaparral areas of the mesas, plains, and low hills in the desert portion of central western Texas, from about the Devils and Pecos Rivers westward. The chaparral here is, on the whole, of less height and also much more open than that in the central southern part of the State. The large proportion of cactuses, tall yuccas, agaves, and thorny or grayish green shrubs gives it a decidedly desert aspect. The characteristic birds of this area are largely desert species that live in bushes and thickets.

The subjoined list of plants discloses the facies of the flora:

Selaginella lepidophylla
Ephedra antisyphilitica
Ephedra nevadensis
Ephedra torreyana
Hechtia texensis
Dasylirion graminifolium
Dasylirion texanum
Hesperaloe parviflora
Nolina erumpens
Nolina lindheimeri
Nolina texana
Samuela faxoniana

Yucca constricta
Yucca elata
Yucca macrocarpa
Yucca treculeana
Agave lechuguilla
Eriogonum havardii
Eriogonum suffruticosum
Atriplex acanthocarpa
Atriplex canescens
Tidestromia suffruticosa
Abronia angustifolia
Abronia fragrans
Acleisanthes wrightii
Allionia albida
Allioniella oxybaphoides
Anulocaulis leiosolenus
Boerhaavia viscosa
Boerhaavia wrightii
Selinocarpus angustifolius
Selinocarpus chenopodioides
Talinopsis frutescens
Odostemon trifoliolatus
Lesquerella argyrea
Lesquerella fendleri
Nerisyrenia camporum
Nerisyrenia linearifolia
Cowania ericaefolia
Fallugia paradoxa
Acacia berlandieri
Acacia constricta
Acacia greggii
Acuan velutina
Calliandra conferta
Leucaena pulverulenta
Leucaena retusa
Mimosa biuncifera
Mimosa borealis
Mimosa fragrans
Prosopis glandulosa
Strombocarpa pubescens
Cassia bauhinioides
Cassia pumilio
Cercidium texanum
Hoffmannseggia brachycarpa
Hoffmannseggia drepanocarpa
Hoffmannseggia jamesii
Hoffmannseggia oxycarpa
Krameria canescens
Krameria glandulosa
Krameria ramosissima
Krameria secundiflora
Eysenhardtia amorphoides
Parosela formosa
Parosela frutescens
Monoxalis dichondraefolia
Kallstroemia grandiflora
Covillea glutinosa
Porlieria angustifolia
Koeberlinia spinosa
Helietta parvifolia
Rutosma texanum
Aspicarpa longipes
Galphimia angustifolia
Castela nicholsonii
Bernardia myricaefolia
Mozinna spathulata
Trichosterigma antisyphilitica
Rhoeidium microphyllum
Rhus virens
Schaefferia cuneifolia
Condalia obovata
Condalia spathulata
Karwinskia humboldtiana
Microrhamnus ericoides
Zizyphus obtusifolius
Mortonia scabrella
Gayoides crispus
Malvastrum coccineum
Sida filipes
Sida hederacea
Sida neomexicana
Ayenia microrphylla
Ayenia pusilla
Hermannia texana
Fouquieria splendens
Amoreuxia wrightii
Ariocarpus fissuratus
Echinocactus brevihamatus
Echinocactus hamatacanthus
Echinocactus horizonthalonius
Echinocactus longihamatus
Echinocactus setispinus
Echinocactus texensis
Echinocactus wislizeni
Echinocereus caespitosus
Echinocereus dasyacanthus

Echinocereus dubius
Echinocereus enneacanthus
Echinocereus paucispinus
Echinocereus pectinatus
Echinocereus stramineus
Mamillaria heyderi
Mamillaria micromeris
Mamillaria pectinata
Mamillaria pusilla
Mamillaria scolymoides
Mamillaria vivipara
Opuntia arborescens
Opuntia arenaria
Opuntia engelmanni
Opuntia leptocaulis
Peniocereus greggii
Acrolasia albicaulis
Cevallia sinuata
Eucnide bartonioides
Nuttallia multiflora
Forestiera angustifolia
Menodora heterophylla
Macrosiphonia berlandieri
Gilia havardi
Gillia longiflora
Gilia multiflora
Marilaunidium hispidum
Coldenia canescens
Coldenia greggii
Coldenia hispidissima
Lippia ligustrina
Salvia ballotaeflora
Lycium pallidum
Quincula lobata
Leucophyllum minus
Leucophyllum texanum
Aciphyllaea acerosa
Baileya multiradiata
Chrystactinia mexicana
Flourensia cernua
Grindelia squarrosa
Laphamia angustifolia
Pectis angustifolia
Pectis longipes
Pectis papposa
Perezia nana
Perezia wrightii
Porophyllum gracile
Porophyllum scoparium
Sartwellia flaveriae
Tetraneuris scaposa
Thymophylla greggii
Thymophylla hartwegi
Thymophylla pentachaeta
Thymophylla thurberi
Trixis californica
Villanova dissecta
Zexmenia brevifolia

Birds here are comparatively numerous and the list of species is as follows:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Cerchneis sparveria phalaena
Rhynchofalco fuscocoerulescens septentrionalis (R)
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetus canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Lophortyx gambelii gambelii
Callipepla squamata pallida
Colinus virginianus texanus
Chaemepelia passerina pallescens (R)
Scardafella inca (R)
Zenaidura macroura marginella
Geococcyx californianus
Centurus aurifrons (R)
Dryobates scalaris symplectus
Dryobates scalaris cactophilus
Speotyto cunicularia hypugaea
Bubo virginianus pallescens
Otus asio cineraceus
Phalaenoptilus nuttalhi nuttallii
Chordeiles minor henryi

Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Archilochus alexandri
Pyrocephalus rubinus mexicanus
Horizopus richardsonii richardsonii (R)
Myiarchus cinerascens cinerascens
Tyrannus verticalis
Tyrannus vociferans
Muscivora forficata
Otocoris alpestris leucolaema
Toxostoma crissalis
Toxostoma curvirostris curvirostris
Mimus polyglottos leucopterus
Polioptila melanura
Polioptila caerulea obscura
Salpinctes obsoletus obsoletus
Thryomanes bewickii cryptus
Thryomanes bewickii eremophilus
Heleodytes brunneicapillus couesi
Auriparus flaviceps flaviceps
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus exubitorides
Vireo bellii bellii
Vireo bellii medius
Vireo bellii arizonae
Hirundo rustica erythrogastris
Progne subis subis
Icteria virens longicauda
Sturnella neglecta neglecta
Xanthocephalus xanthocephalus
Icterus parisorum
Icterus cucullatus sennetti (R)
Icterus spurius
Euphagus cyanocephalus
Molothrus ater ater
Molothrus ater obscurus
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Pyrrhuloxia sinuata sinuata
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Passerina amoena
Pipilo fuscus mesoleucus
Spizella passerina arizonae
Amphispiza bilineata bilineata
Amphispiza bilineata deserticola
Peucaea cassinii
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Pooecetes gramineus confinis
Chondestes grammacus strigatus
Carpodacus mexicanus frontalis
Astragalinus psaltria psaltria

Desert Grass Association.

The portions of the deserts, mesas, hills, and plains in central western Texas beyond the Devils and Pecos Rivers that have for their chief vegetation a covering, often more or less scanty, or grass, or that lack even this, are included in the present area. In addition to grasses, the only plants present are a few herbaceous species and cactuses. The number of birds is not large, and consists chiefly of desert forms, mostly those that are attracted by open land or grassy areas. As compared with either the Desert Chaparral or Desert Riparian associations the effect of the difference in vegetation on the bird life is very marked.

The plants found here are principally as follows:

Andropogon cirrhatus *Andropogon hirtiflorus*

Aristida arizonica
Aristida bromoides
Aristida divaricata
Aristida fendleriana
Aristida nealleyi
Aristida purpurea
Bouteloua aristidoides
Bouteloua breviseta
Bouteloua chondrosioides
Bouteloua eriopoda
Bouteloua gracilis
Bouteloua hirsuta
Bouteloua uniflora
Cathestecum erectum
Elyonurus barbiculmis
Elyonurus tripsacoides
Epicampes rigens
Epicampes stricta
Eragrostis lugens
Eriochloa punctata
Heteropogon contortus
Hilaria cenchroides
Hilaria jamesii
Hilaria mutica
Lycurus phleoides
Muhlenbergia arenicola
Muhlenbergia berlandieri
Muhlenbergia capillaris rigida
Muhlenbergia depauperata
Muhlenbergia monticola
Muhlenbergia parviglumis
Muhlenbergia porteri
Panicum arizonicum
Panicum hallii
Panicum hirticaule
Panicum huachucae
Panicum obtusum
Panicum reverchoni
Pappophorum vaginatum
Pappophorum wrightii
Poa bigelovii
Sphenopholis interrupta
Sporobolus auriculatus
Sporobolus buckleyi
Sporobolus confusus
Sporobolus flexuosus
Sporobolus texanus
Sporobolus wrightii
Stipa emineus
Trachypogon mountufari
Thichloris mendocina
Tridens albescens
Tridens avenaceus
Tridens muticus
Tridens pilosus
Tridens pulchellus
Tridens texanus
Abronia angustifolia
Selinocarpus angustifolius
Argemone platyceras
Nerisyrenia camporum
Sida diffusa
Sida physocalyx
Raimannia heterophylla
Echinocactus texensis
Echinocereus caespitosus
Echinocereus enneacanthus
Echinocereus stramineus
Mamillaria heyderi
Mamillaria vivipara
Marilaunidium hispidum
Verbena bipinnatifida
Verbena bracteosa
Verbena canescens
Verbena ciliata
Verbena hastata
Castilleja integra
Castilleja lanata
Castilleja sessiliflora
Baileya multiradiata
Hymenoxys odorata
Porophyllum gracile
Ratibida columnifera
Thymophylla polychaeta

The birds are:

Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Cerchneis sparveria phalaena
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni

Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Callipepla squamata pallida
Oxyechus vociferus vociferus
Zenaidura macroura marginella
Speotyto cunicularia hypugaea
Chordeiles minor henryi
Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Aeronautes saxatalis
Otocoris alpestris leucolaema
Salpinctes obsoletus obsoletus
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Phainopepla nitens
Hirundo rustica erythrogastris
Progne subis subis
Sturnella magna hoopesi
Xanthocephalus xanthocephalus
Euphagus cyanocephalus
Molothrus ater ater
Molothrus ater obscurus
Ammodramus savannarum bimaculatus
Pooecetes gramineus confinis
Chondestes grammacus strigatus
Passer domesticus domesticus

Desert Riparian Association.

The canyons, narrow stream valleys, and isolated springs of the desert region of western Texas, beyond the Devils and Pecos Rivers, make up the present association. Here the contrast between the arid mesas and plains of the upland and the moist valleys is most marked, and both flora and fauna reflect this great difference. The canyons and valleys support a variety of plant life, for in addition to many of the characteristic species of the mesas there grow here many moisture loving trees and shrubs. A more or less dense low chaparral usually covers the sides of these canyons and valleys; while thickets of more hydrophilous shrubs, and in many cases an arboreal growth of considerable height occupy their bottoms along the streams. About the isolated springs on the upland or in the plain-like broad valleys there usually spring up clumps of trees, chiefly *Populus monilifera.* As might be expected, this kind of environment, particularly in view of the absence of such vegetation from most of the surrounding desert, proves very attractive to birds that live in trees or bushes; and this is, in fact, one of the very best ornithological grounds in the entire State.

The character of the vegetation may be judged from the following list of plants:

Selaginella lepidophylla
Juniperus sabinoides (R)
Ephedra antisyphilitica
Ephedra nevadensis
Typha latifolia
Arundinaria macrosperma

Dasylirion texanum
Hesperaloe parvifolia
Yucca macrocarpa
Smilax bonanox
Populus deltoides
Salix nigra
Hicoria pecan (R)
Juglans rupestris
Quercus undulata
Quercus virginiana (R)
Celtis occidentalis
Celtis reticulata
Momisia pallida
Morus rubra
Eriogonum jamesii
Eriogonum rotundifolium
Eriogonum tenellum
Eriogonum trichopodum
Eriogonum wrightii
Atriplex canescens
Anulocaulis leiosolenus
Boerhaavia bracteosa
Boerhaavia purpurascens
Boerhaavia torreyana
Boerhaavia viscosa
Commicarpus scandens
Selinocarpus chenopodioides
Selinocarpus diffusus
Phytolacca americana
Clematis drummondii
Viorna pitcheri
Viorna reticulata
Odostemon trifoliolatus
Argemone platyceras
Arabis ludoviciana
Arabis petiolaris
Bursa pubens
Draba cuneifolia
Lepidium alyssoides
Lepidium intermedium
Radicula obtusa
Radicula palustris
Streptanthus carinatus
Platanus occidentalis
Fallugia paradoxa
Rosa fendleri
Acacia constricta
Acacia roemeriana
Acacia schottii
Leucaena pulverulenta
Leucaena retusa
Mimosa borealis
Prosopis glandulosa
Strombocarpa pubescens
Vachellia farnesiana
Cercis occidentalis
Hoffmannseggia densiflora
Broussonetia secundiflora
Eysenhardtia amorphoides
Glycyrrhiza lepidota
Parosela frutescens
Parosela scoparia
Covillea glutinosa
Guaiacum sanctum
Porlieria angustifolia
Koeberlinia spinosa
Ptelea mollis
Aspicarpa hyssopifolia
Bernardia myricaefolia
Croton torryeanus
Mozinna spathulata
Pistacia mexicana
Rhoeidium microphyllum
Rhus virens
Toxicodendron radicans
Colubrina texensis
Condalia spathulata
Karwinskia humboldtiana
Rhamnus caroliniana
Zizyphus obtusifolius
Mortonia scabrella
Sapindus drummondii
Ungnadia speciosa
Vitis arizonica
Vitis candicans
Vitis riparia
Vitis rupestris
Hermannia texana
Fouquieria splendens
Ariocarpus fissuratus
Echinocactus brevihamatus
Echinocactus hamatacanthus
Echinocactus horizonthalonius
Echinocactus longihamatus
Echinocereus enneacanthus
Echinocereus paucispinus

Echinocereus stramineus
Mamillaria echinus
Mamillaria heyderi
Opuntia engelmanni
Opuntia grahami
Opuntia leptocaulis
Peniocereus greggii
Oenothera jamesii
Brayodendron texanum
Forestiera angustifolia
Fraxinus greggii
Gilia incisa
Phlox drummondii
Lippia lingustrina
Salvia chamaedryoides
Lycium berlandieri
Nicotiana glauca
Physalis lanceolata
Castilleja lanata
Leucophyllum texanum
Ruellia tuberosa
Chilopsis linearis
Stenolobium stans
Cephalanthus occidentalis
Apodanthera undulata
Cucurbita foetidissima
Ibervillea lindheimeri
Ibervillea tenuisecta
Xanthium canadense
Baccharis bigelovii
Baccharis glutinosa
Baccharis salicina
Bahia bigelovii
Cirsium wrightii
Grindelia squarrosa
Laphamia bisetosa
Perezia wrightii
Perityle parryi
Porophyllum macrocephalum
Trixis californica

Its long list of birds is as follows:

Nyctanassa violacea (R)
Butorides virescens virescens (R)
Ardea herodias treganzai (R)
Spatula clypeata (R)
Querquedula cyanoptera (R)
Querquedula discors
Coragyps urubu urubu
Cathartes aura septentrionalis
Cerchneis sparveria sparveria
Cerchneis sparveria phalaena
Rhynchofalco fuscocoerulescens septentrionalis (R)
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Haliaeetus leucocephalus leucocephalus (R)
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Circus cyaneus hudsonius (R)
Pandion haliaetus carolinensis (R)
Meleagris gallopavo intermedia (R)
Callipepla squamata pallida
Colinus virginianus texanus
Fulica americana (R)
Oxyechus vociferus vociferus
Actitis macularia (R)
Chaemepelia passerina pallescens (R)
Zenaidura macroura marginella
Geococcyx californianus
Coccyzus americanus occidentalis
Colaptes cafer collaris
Centurus aurifrons (R)
Dryobates scalaris symplectus
Dryobates scalaris cactophilus
Chloroceryle americana septentrionalis
Streptoceryle alcyon alcyon
Bubo virginianus pallescens
Otus asio cineraceus
Phalaenoptilus nuttallii nuttallii
Chordeiles minor henryi
Chordeiles minor aserriensis
Chordeiles acutipennis texensis
Archilochus alexandri
Aeronautes saxatalis
Pyrocephalus rubinus mexicanus
Empidonax traillii brewsteri

Horizopus richardsonii richardsonii
Sayornis sayus
Sayornis nigricans semiater
Myiarchus cinerascens cinerascens
Tyrannus verticalis
Tyrannus vociferans
Muscivora forficata
Toxostoma crissalis
Toxostoma curvirostris curvirostris
Mimus polyglottos leucopterus
Polioptila melanura
Polioptila caerulea obscura
Catherpes mexicanus polioptilus
Catherpes mexicanus albifrons
Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus
Thryothorus ludovicianus ludovicianus
Heleodytes brunneicapillus couesi
Psaltriparus plumbeus plumbeus
Psaltriparus melanotis lloydi
Auriparus flaviceps flaviceps
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo bellii bellii
Vireo bellii medius
Vireo bellii arizonae
Vireo atricapillus
Lanivireo solitarius plumbeus
Vireosylva gilva swainsonii
Vireosylva olivacea
Phainopepla nitens
Hirundo rustica erythrogastris
Riparia riparia riparia
Stelgidopteryx serripennis serripennis
Petrochelidon albifrons tachina
Progne subis subis
Icteria virens longicauda
Geothlypis trichas occidentalis
Dendroica aestiva sonorana
Xanthocephalus xanthocephalus
Agelaius phoeniceus neutralis
Icterus bullocki bullockii
Icterus parisorum
Icterus cucullatus sennetti (R)
Icterus spurius
Euphagus cyanocephalus
Molothrus ater ater
Molothrus ater obscurus
Piranga rubra rubra
Piranga rubra cooperi
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Pyrrhuloxia sinuata sinuata
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Passerina amoena
Pipilo fuscus mesoleucus
Spizella passerina arizonae
Amphispiza bilineata bilineata
Amphispiza bilineata deserticola
Peucaea cassinii
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Pooecetes gramineus confinis
Chondestes grammacus strigatus
Carpodacus mexicanus frontalis
Astragalinus psaltria psaltria

Alkali Association.

This comprises the bare alkali flats of the desert region west of the Pecos River, where both vegetable and animal life are reduced to a minimum. About the only vegetation is salt grass, but a few other low halophilous plants grow, chiefly about the margins of these hard, sun-baked plains. As a consequence chiefly of the lack of vegetation, this area offers little or no attraction to bird life; and the smallness

of the number of species that occur here bears eloquent tribute to the effect of vegetation on the avifauna.

The principal plants are:

Distichlis spicata
Allenrolfea occidentalis
Atriplex expansa
Dondia depressa
Dondia suffrutescens
Monolepis nuttalliana
Salicornia perennis

The only birds frequenting this area are:

Cathartes aura septentrionalis
Accipiter cooperii (R)
Accipiter velox (R)
Oxyechus vociferus vociferus
Chordeiles minor henryi
Otocoris alpestris leucolaema
Corvus cryptoleucus
Corvus corax sinuatus
Amphispiza bilineata bilineata
Peucaea cassinii

Mountain Chaparral Association.

This comprises the chaparral on the lower slopes and in the canyons of the mountains in central western Texas, beyond the Pecos River, and extends to an altitude of some 5000 to 6000 feet, in places somewhat higher. In general character it does not differ from the chaparral of the more level desert country, but is of somewhat different composition, with fewer cactuses and yuccas and an infusion of mountain forms. The bird life, too, shows the effect of the proximity of the vegetation of the higher mountain altitudes.

The principal plants are as follows:

Selaginella lepidophylla
Aristida nealleyi
Bouteloua breviseta
Bouteloua chondrosioides
Bouteloua curtipendula
Bouteloua eriopoda
Bouteloua gracilis
Bouteloua parryi
Bouteloua ramosa
Melica porteri
Muhlenbergia arenicola
Muhlenbergia berlandieri
Muhlenbergia capillaris
Muhlenbergia monticola
Muhlenbergia repens rigida
Panicum hallii
Panicum havardii
Dasylirion texanum
Nolina microcarpa
Yucca baccata
Yucca elata
Agave applanata
Agave lechuguilla
Agave wislizeni
Salix nigra
Celtis reticulata
Momisia pallida
Aristolochia brevipes
Eriogonum abertianum
Eriogonum annuum
Eriogonum havardi
Eriogonum microthecum
Eriogonum rotundifolium
Eriogonum suffruticosum
Eriogonum wrightii
Boerhaavia anisophylla
Boerhaavia erecta
Boerhaavia viscosa

Boerhaavia wriyhtii
Odostemon trifoliolatus
Fallugia paradoxa
Prunus minutiflora
Acacia constricta
Mimosa biuncifera
Mimosa flexuosa
Prosopis glandulosa
Hoffmannseggia densiflora
Hoffmannseggia melanosticta
Krameria canescens
Broussonetia secundiflora
Eysenhardtia amorphoides
Parosela argyraea
Parosela jamesii
Parosela lachnostachys
Parosela wrightii
Koeberlinia spinosa
Porlieria angustifolia
Rutosma texanum
Chamaesyce polycarpa
Chamaesyce villifera
Croton lindheimerianus
Ditaxis humilis
Mozinna spathulata
Tithymalus campestris
Tithymalus chamaesula
Tithymalus montanus
Rhoeidium microphyllum
Rhus virens
Schmaltzia trilobata
Ceanothus greggii
Zizyphus obtusifolius
Ungnadia speciosa
Fouquieria splendens
Echinocactus horizonthalonius
Echinocactus intertextus
Echinocactus longihamatus
Echinocereus dasyacanthus
Echinocereus stramineus
Mamillaria grahami
Mamillaria meiacantha
Mamillaria micromeris
Mamillaria vivipara
Opuntia arborescens
Opuntia engelmanni
Opuntia kleiniae
Opuntia leptocaulis
Brayodendron texanum
Forestiera angustifolia
Macrosiphonia wrightii
Lippia ligustrina
Salvia regla
Lycium berlandieri
Leucophyllum minus
Leucophyllum texanum
Pentsteman barbatus
Pentstemon havardi
Chilopsis linearis
Stenolobium stans
Pectis filipes
Perityle vaseyi

The birds in this area are included in the following list:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Rhynchodon peregrinus anatum (R)
Planifalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Cyrtonyx montezumae mearnsi
Callipepla squamata pallida
Zenaidura macroura marginella
Chloroenas fasciata fasciata
Geococcyx californianus
Dryobates scalaris cactophilus
Bubo virginianus pallescens
Otus asio cineraceus
Phalaenoptilus nuttallii nuttallii
Chordeiles minor henryi
Chordeiles acutipennis texensis
Calothorax lucifer
Archilochus alexandri
Selasphorus platycercus
Aeronautes saxatalis
Horizopus richardsonii richardsonii (R)
Empidonax wrightii
Sayornis sayus

Sayornis nigricans semiater
Myiarchus cinerascens cinerascens
Tyrannus vociferans
Toxostoma curvirostris curvirostris
Mimus polyglottos leucopterus
Polioptila melanura
Polioptila caerulea obscura
Catherpes mexicanus polioptilus
Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus
Heleodytes brunneicapillus couesi
Psaltriparus plumbeus
Psaltriparus melanotis lloydi
Auriparus flaviceps flaviceps
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Corvus cryptoleucus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Hirundo rustica erythrogastris
Icteria virens longicauda
Xanthocephalus xanthocephalus (R)
Icterus parisorum
Icterus spurius
Molothrus ater ater
Guiraca caerulea lazula
Passerina versicolor versicolor (R)
Passerina ciris pallidior
Pipilo fuscus mesoleucus
Pipilo maculatus montanus
Oberholseria chlorura (R)
Spizella passerina arizonae
Amphispiza bilineata deserticola
Peucaea cassinii
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Chondestes grammacus strigatus
Carpodacus mexicanus frontalis
Astragalinus psaltria psaltria

Mountain Oak Association.

The deciduous forests of the middle slopes and canyons of the high mountains in central western Texas, beyond the Pecos River, form a fairly well defined association. These forests are rather low, but well cover the ground, and in many places have considerable underbrush. Oaks of several species form the dominating element, though various other deciduous trees constitute a considerable admixture. The characteristic birds are forest species, some of them peculiar to the mountains.

The principal plants are:

***Pinus edulis* (R)**
***Juniperus flaccida* (R)**
***Juniperus monosperma* (R)**
Allium scaposum
Nolina microcarpa
Yucca baccata
Agave applanata
Agave wislizeni
Salix irrorata
Salix wrightii
Juglans rupestris
Quercus emoryi
Quercus fendleri
Quercus grisea
Quercus hypoleuca
Quercus muhlenbergii
Quercus novomexicana
Quercus oblongifolia
Quercus texana
Quercus undulata
Celtis reticulata
Morus microphylla
Eriogonum abertianum
Eriogonum rotundifolium
Eriogonum wrightii
Mirabilis wrightiana

Quamoclidion multiflorum
Aquilegia chrysantha
Aquilegia longissima
Clematis drummondii
Odostemon haematocarpus
Odostemon repens
Heuchera rubescens
Philadelphus microphyllus
Cercocarpus montanus
Fallugia paradoxa
Rosa arkansana
Padus acutifolia
Padus salicifolia
Cercis occidentalis
Mimosa biuncifera
Linum greggii
Linum rigidum
Ionoxalis violacea
Ptelea angustifolia
Ptelea mollis
Rutosma texanum
Polygala puberula
Polygala scoparia
Tithymalus campestris
Tithymalus chamaesula
Tithymalus montanus
Schmaltzia trilobata
Toxicodendron toxicodendron
Adolphia infesta
Ceanothus greggii
Rhamnus purshiana
Rhamnus tomentella
Sapindus drummondii
Vitus rupestris
Garrya lindheimeri
Garrya wrightii
Arbutus texana
Fraxinus berlandieri
Fraxinus cuspidata
Fraxinus greggii
Fraxinus pistaciaefolia
Gilia texana
Phlox drummondii
Salvia regla
Castilleja lanata
Pentstemon barbatus
Pentstemon cyananthus
Pentstemon havardi
Chilopsis linearis
Lonicera albiflora
Symphoricarpos longiflorus
Symphoricarpos rotundifolius
Artemisia frigida
Artemisia redolens
Berlandiera lyrata
Perityle vaseyi

The birds of this area are:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Meleagris gallopavo merriami(R)
Cyrtonyx montezumae mearnsi
Zenaidura macroura marginella
Chloroenas fasciata fasciata
Geococcyx californianus
Coccyzus americanus occidentalis
Colaptes cafer collaris
Balanosphyra formicivora formicivora
Balanosphyra formicivora aculeata
Dryobates scalaris cactophilus
Bubo virginianus pallescens
Otus asio cineraceus
Otus flammeolus (R)
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Calothorax lucifer
Archilochus alexandri
Selasphorus platycercus
Aeronautes saxatalis
Nuttallornis borealis majorinus (R)
Horizopus richardsonii richardsonii
Empidonax wrightii

Sayornis sayus
Sayornis nigricans semiater
Myiarchus cinerascens cinerascens
Tyrannus vociferans
Sialia mexicana bairdi (R)
Turdus migratorius propinquus (R)
Polioptila melanura
Polioptila caerulea obscura
Catherpes mexicanus polioptilus
Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus
Sitta carolinensis nelsoni
Psaltriparus plumbeus plumbeus
Psaltriparus melanotis lloydi
Penthestes gambeli gambeli
Baeolophus inornatus griseus
Baeolophus atricristatus atricristatus
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo huttoni stephensi
Lanivireo solitarius plumbeus
Vireosylva olivacea (R)
Icterus parisorum
Icterus spurius
Piranga ludoviciana (R)
Piranga hepatica oreophasma (R)
Piranga rubra cooperi
Hedymeles melanocephalus papago
Pipilo fuscus mesoleucus
Pipilo maculatus montanus
Spizella passerina arizonae
Amphispiza bilineata deserticola
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Carpodacus mexicanus frontalis
Astragalinus psaltria psaltria

Mountain Pinyon Association.

The portions of the middle and upper slopes of the Texas mountains, west of the Pecos River, that are covered by juniper and pinyon timber are included in this area.

While the forest has much the same general character as in the Mountain Osk Association, the dominant place of the oaks in that area is taken by the pinyons and junipers, chiefly *Pinus edulis, Pinus cembroides, Juniperus pachyphloea, Juniperus monosperma,* and *Juniperus sabinoides.* The stand of pinyon and juniper is in places almost pure, but in many others has a considerable admixture of oaks and similar deciduous trees.

The principal elements of the vegetation are disclosed by the following list:

Pinus cembroides
Pinus edulis
Juniperus flaccida
Juniperus monosperma
Juniperus pachyphloea
Juniperus sabinoides
Juniperus scopulorum
Allium scaposum
Nolina microcarpa
Salix irrorata
Salix wrightii
Quercus emoryi
Quercus fendleri
Quercus grisea
Quercus novomexicana
Juglans rupestris

Celtis reticulata
Morus microphylla
Phoradendron bolleanum
Eriogonum abertianum
Eriogonum rotundifolium
Eriogonum wrightii
Mirabilis wrightiana
Quamoclidion multiflorum
Aquilegia chrysantha
Aquilegia longissima
Clematis drummondii
Odostemon fremonti
Odostemon repens
Heuchera rubescens
Philadelphus microphyllus
Cercocarpus montanus
Fallugia paradoxa
Rosa arkansana
Padus acutifolia
Padus salicifolia
Cercis occidentalis
Linum greggii
Linum rigidum
Ionoxalis violacea
Ptelea angustifolia
Ptelea mollis
Rutosma texanum
Polygala puberula
Polygala scoparia
Tithymalus campestris
Tithymalus chaemesula
Tithymalus montanus
Schmaltzia trilobata
Toxicodendron toxicodendron
Adolphia infesta
Ceanothus greggii
Rhamnus purshiana
Rhamnus tomentella
Vitis rupestris
Garrya lindheimeri
Garrya wrightii
Arbutus texana
Fraxinus berlandieri
Fraxinus cuspidata
Fraxinus greggii
Fraxinus pistaciaefolia
Gilia texana
Phlox drummondii
Salvia regla
Castilleja lanata
Pentstemon barbatus
Pentstemon cyananthus
Pentstemon havardi
Lonicera albiflora
Symphoricarpos longiflorus
Symphoricarpos rotundifolius
Artemisia frigida
Artemisia redolens
Berlandiera lyrata
Perityle vaseyi

The birds frequenting this association are:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Meleagris gallopavo merriami (R)
Cyrtonyx montezumae mearnsi
Zenaidura macroura marginella
Chloroenas fasciata fasciata
Colaptes cafer collaris
Balanosphyra formicivora formicivora
Balanosphyra formicivora aculeata
Sphyrapicus varius nuchalis (R)
Dryobates scalaris cactophilus
Dryobates villosus leucothorectis
Bubo virginianus pallescens
Otus asio cineraceus
Otus flammeolus (R)
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Archilochus alexandri
Selasphorus platycercus
Aeronautes saxatalis
Nuttallornis borealis majorinus (R)
Myiarchus cinerascens cinerascens

Horizopus richardsonii richardsonii
Tyrannus vociferans
Sialia mexicana bairdi
Turdus migratorius propinquus (R)
Polioptila melanura
Polioptila caerulea obscura
Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus
Sitta pygmaea pygmaea
Sitta carolinensis nelsoni
Psaltriparus plumbeus plumbeus
Psaltriparus melanotis lloydi
Penthestes gambeli gambeli
Baeolophus inornatus griseus
Baeolophus atricristatus atricristatus
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Cyanocephalus cyanocephalus
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Vireo huttoni stephensi
Lanivireo solitarius plumbeus
Dendroica auduboni memorabilis
Piranga ludoviciana (R)
Piranga hepatica oreophasma
Piranga rubra cooperi
Hedymeles melanocephalus papago
Pipilo maculatus montanus
Spizella passerina arizonae
Junco dorsalis
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca

Mountain Pine and Spruce Association.

This comprises the somewhat limited areas along the upper slopes and in the higher canyons of the western Texas mountains, beyond the Pecos River, where the dominating arboreal vegetation consists of pine, spruce, and cypress. These trees form in many places a tall forest with practically no undergrowth. Elsewhere, particularly in the canyons, there is a considerable mixture of deciduous trees with some underbrush. The characteristic birds are mostly mountain species of the coniferous forest.

The principal plants are as follows:

Pinus brachyptera
Pinus flexilis
Pseudotsuga mucronata
Cupressus arizonica
Populus aurea
Salix irrorata
Ostrya baileyi
Quercus emoryi
Quercus fendleri
Quercus grisea
Quercus leucophylla
Quercus muhlenbergii
Quercus novomexicana
Quercus texana
Quercus undulata
Aquilegia chrysantha
Aquilegia longissima
Odostemon repens
Heuchera rubescens
Philadelphus microphyllus
Cercocarpus montanus
Rosa arkansana
Sericotheca dumosa
Amelanchier alnifolia
Padus acutifolia
Cercis occidentalis
Robinia neomexicana
Linum lewisii
Ionoxalis violacea
Ptelea mollis

Polygala scoparia
Schmaltzia trilobata
Toxicodendron toxicodendron
Ceanothus greggii
Rhamnus purshiana
Acer grandidentatum
Vitis rupestris
Garrya lindheimeri
Arbutus texana (R)
Fraxinus greggii
Fraxinus viridis
Gilia texana
Solanum fendleri
Castilleja lanata
Lonicera albiflora
Symphoricarpos longiflorus
Campanula petiolata

The birds frequenting this association are as follows:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Meleagris gallopavo merriami (R)
Cyrtonyx montezumae mearnsi
Chloroenas fasciata fasciata
Colaptes cafer collaris
Balanosphyra formicivora formicivora
Balanosphyra formicivora aculeata
Sphyrapicus varius nuchalis (R)
Dryobates villosus leucothorectis
Bubo virginianus pallescens
Otus asio cineraceus
Otus flammeolus (R)
Strix occidentalis lucida (R)
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Selasphorus platycercus
Aeronautes saxatalis
Nuttallornis borealis majorinus (R)
Horizopus richardsonii richardsonii
Empidonax difficilis difficilis
Tyrannus vociferans (R)
Sialia mexicana bairdi
Turdus migratorius propinquus (R)
Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus
Sitta pygmaea pygmaea
Sitta carolinensis nelsoni
Psaltriparus plumbeus plumbeus
Psaltriparus melanotis lloydi
Penthestes gambeli gambeli
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Corvus corax sinuatus
Vireo huttoni stephensi
Lanivireo solitarius plumbeus
Dendroica auduboni memorabilis
Piranga ludoviciana (R)
Piranga hepatica oreophasma
Hedymeles melanocephalus papago
Pipilo maculatus montanus
Junco dorsalis
Loxia curvirostra stricklandi (R)

Mountain Grass Association.

This comprises the open grassy valleys, which the grassy slopes and meadows on the middle and upper portions of the mountains in central western Texas, beyond the Pecos River, mostly above an altitude of 5500 feet. In addition to the more or less luxuriant carpet of grasses, the vegetation consists of various flowering herbaceous plants, with scattered

individuals of *Agave wislizeni, Agave applanata, Yucca baccata, and Nolina microcarpa.*

The principal plants are as follows:

Aristida bromoides
Aristida schiediana
Blepharoneuron tricholepsis
Bouteloua aristidoides
Bouteloua curtipendula
Bouteloua gracilis
Bouteloua parryi
Bouteloua ramosa
Bouteloua texana
Cottea pappophoroides
Eragrostis limbata
Melica porteri
Muhlenbergia lemmoni
Muhlenbergia ligulata
Muhlenbergia pauciflora
Muhlenbergia repens
Muhlenbergia setifolia
Muhlenbergia trifida
Oryzopsis fimbriata
Oryzopsis hymenoides
Panicum hallii
Panicum havardii
Poa bigelovii
Stipa emineus
Stipa neomexicana
Stipa pringlei
Stipa tenuissima
Stipa viridula
Trichloris mendocina
Allium palmeri
Allium scaposum
Nolina microcarpa
Yucca baccata
Agave applanata
Agave wislizeni
Eriogonum abertianum
Eriogonum annuum
Eriogonum microthecum
Eriogonum wrightii
Eurotia lanata
Mirabilis longiflora
Quamoclidion multiflorum
Aquilegia chrysantha
Aquilegia longissima
Linum greggii
Linum lewisii
Rutosma texanum
Polygala scoparia
Chamaesyce villifera
Tithymalus campestris
Tithymalus montanus
Gilia longiflora
Gilia texana
Phlox drummondii
Salvia regla
Castilleja lanata
Castilleja lindheimeri
Pentstemon barbatus
Pentstemon cyananthus
Pentstemon havardi
Cucurbita foetidissima
Artemisia frigida
Bahia bigelovii
Berlandiera lyrata
Centaurea americana
Chrysothamnus pulchellus
Grindelia squarrosa
Helianthus annuus
Pectis filipes
Pertityle vaseyi
Solidago bigelovii

The birds found here are:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Rhynchodon peregrinus anatum (R)
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Meleagris gallopavo merriami (R)
Cyrtonyx montezumae mearnsi

Callipepla squamata pallida
Oxyechus vociferus vociferus
Zenaidura macroura marginella
Chloroenas fasciata fasciata
Geococcyx californianus
Chordeiles minor henryi
Cyanolaemus clemenciae bessophilus
Calothorax lucifer
Archilochus alexandri
Selasphorus platycercus
Aeronautes saxatalis
Turdus migratorius propinquus (R)
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Progne subis subis
Xanthocephalus xanthocephalus
Molothrus ater ater
Pipilo fuscus mesoleucus
Spizella passerina arizonae
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Chondestes grammacus strigatus

Mountain Mural Association.

This association is made up of the bare rock slopes, cliffs, and canyons of the mountains in the trans-Pecos region of central western Texas. Here and there a little grass, a rock plant or stunted shrub constitute the only vegetation. This absence of plant life is largely responsible for the very small bird fauna found here.

The chief plants are included in the following list:

Cheilanthes tomentosa
Cheilanthes wrightii
Gymnogramme ehrenbergiana
Notholaena schaffneri
Notholaena standleyi
Pellaea aspera
Selaginella lepidophylla
Selaginella pringlei
Ephedra trifurca
Aristida nealleyi
Cottea pappophoroides
Melica nitens
Muhlenbergia gracillima
Muhlenbergia repens
Panicum havardi
Scleropogon brevifolius
Stipa neomexicana
Cotyledon strictiflora
Sedum liebmannianum
Sedum wrightii
Heuchera rubescens
Cercocarpus montanus
Amelanchier alnifolia
Ceanothus greggii
Ariocarpus fissuratus
Garrya lindheimeri
Nama origanifolium

The birds, also few in number, are as follows:

Cathartes aura septentrionalis
Cerchneis sparveria phalaena
Rhynchodon peregrinus anatum (R)
Planofalco mexicanus (R)
Buteo borealis calurus
Buteo albonotatus albonotatus
Buteo swainsoni
Aquila chrysaetos canadensis
Accipiter cooperii (R)
Accipiter velox (R)
Callipepla squamata pallida
Bubo virginianus pallescens
Chordeiles minor henryi
Aeronautes saxatalis
Sayornis sayus
Sayornis nigricans semiater
Catherpes mexicanus polioptilus

Salpinctes obsoletus obsoletus
Thryomanes bewickii eremophilus (R)
Corvus corax sinuatus
Lanius ludovicianus excubitorides
Progne subis subis
Pipilo fuscus mesoleucus
Aimophila ruficeps scottii
Aimophila ruficeps eremoeca
Carpodacus mexicanus frontalis

CHANGES IN THE BIRD LIFE OF TEXAS.

Changes in Vegetation.

It is, of course, evident that the vegetation of any given area is continually undergoing change. Since these changes more or less vitally, according to their character, affect the dependent bird life, it is of importance to consider briefly the causes of such plant changes.

Plants, under favorable circumstances, tend to increase their geographical range up to the limit of territory suitable for their existence. This is often prevented, however, by extraneous causes, such as natural or artificial barriers and accidents. Among the natural mechanical barriers to the extension of the distribution of plant species may be mentioned oceans and other large bodies of water; swift, deep streams; bare deserts; high, rocky mountain ranges, and the lack of soil. The physiological barriers which determine the area in which a given species of plant may find suitable environment, and by which, of course, its permanent existence is limited, are chiefly temperature, humidity, moisture, light, evaporation, and the character of soil. Of these, temperature and humidity are undoubtedly the most fundamental, as a study of the western deserts clearly shows.

Among the destructive causes which operate to change vegetation may be mentioned the sudden increase in the numbers of destructive insects, which, thereupon, ravage the trees of the forests and other plants, and often lead to practical extermination of the species over considerable areas, which disappearance may be temporary or permanent, according to circumstances. Of the insects, the great increase of which nearly always proves menace to vegetation, may be mentioned the grasshopper, the army worm, and the forest tent caterpillar. Fungous and other plant diseases often cause great destruction to trees or other plants in particular

regions, and sometimes bring about a great change in the local fauna or sylva by practically eliminating certain species. A good example of this is the chestnut blight, which has practically exterminated the chestnut tree in many localities.

Drought, particularly if prolonged, is a very important element in humid or semi-humid regions, and, while it usually has little effect upon the forest, it often eliminates at least temporarily many of the succulent plants. On swamps, marshes, streams, and lakes a prolonged and severe drought has a still more disastrous affect, often exterminating entirely the plants which depend upon much water. The affect of drought is usually not permanent, particularly if water subsequently returns in sufficient quantity.

Floods are more dangerous, and if severe often sweep away the entire vegetation of an area, taking with it even the soil that supported the plants and without which they could not exist. This happens commonly to the grass and annuals; to the shrubs, and even to the trees on such areas as the more or less level bottomlands of rivers; and much of this destruction is irreparable.

Storms, particularly of wind, often destroy large areas of forest, which, thus, in many cases permanently disappear. Such storms are particularly disastrous to the live oak forests of the coast plain. A tornado has a similar though more limited effect on the pines and other woodlands where a broad path is cut through the woods and all the standing timber destroyed. In such cases the subsequent growth is of an entirely different character. The effect of storms upon brushy vegetation is much less marked, but the succulent growth of annuals and other small plants is often made impossible by the storms which sweep over them a deep layer of mud or sand.

Fire is undoubtedly one of the most destructive agents to forest and thicket alike. Forest areas completely burned do not readily become re-forested, and often lie bare for many years. The woody growth that succeeds is usually of other species than those that were destroyed. Thickets and chaparral are often eliminated just as completely. The frequent fires which formerly swept the coast prairies un-

doubtedly kept down the growth of mesquite; for, since these fires have practically ceased, the mesquite is again springing up over large areas. Fire has less effect on grass than on the more shrubby vegetation, indeed, probably little except temporarily. The same is likewise true of the reeds and rushes in the marshes.

Man is probably the most potent and far-reaching agency in the alteration of vegetation. This is particularly true of changes that consist in rapid and widespread destruction, since constructive alterations involve necessarily a longer process. The changes that affect the natural condition of vegetation and that are due to man's influence are chiefly as follows: complete or partial deforestation or forestation, over small or wide areas; the clearing of thickets and brush of various kinds; the draining of lakes, marshes, and swamps; the formation of lakes and other bodies of water, thereby attracting various water plants; and the alteration of stream courses. In addition to these, the very important element of cultivation must be considered in this connection. This has particular reference to the planting of orchards, of various shade and ornamental trees and hedges, of broad, wide stretches of grassy meadows; the sowing of various kinds of grain, including particularly rice; the planting of various other fodder and other crops, the fields of which after harvest become breeding places for enormous numbers of wild plants. So important is this matter of cultivation that the entire face of the country as well as the interrelaionships of the vegetation are thereby altered.

In addition to what has already been mentioned, changes in the flora or sylva of a region sometimes take place from unknown causes. These, as will be noted concerning most of the agencies that cause change, are destructive rather than constructive.

Changes in Bird Life Due to Vegetation.

Since bird life is, as already indicated, so intimately dependent upon vegetation conditions, it follows that alterations in the flora and sylva of a region inevitably cause corresponding changes in the bird life. While of course it is true that some birds are less subject to such influences, be-

cause their habitats are more stable, yet few entirely escape the effect of altered environment. Such changes of environment as take place are probably most marked in the temperate regions, least so in the polar areas and in the most arid deserts. The changes which occur in the bird fauna of any given State or locality concern chiefly increase or decrease of species, but, for convenience, fall into three categories: (1) Appearance and disappearance; (2) increase and decrease; and (3) changes in habit to meet changes in environment. These fluctuations are, to a greater or less extent, continually going on, and are due to either one of two causes or both: the influences of natural phenomena or the changes brought about by man. Those dependent upon natural causes are usually operative over long periods of time, and thus are slow in becoming apparent and often difficult to discover; or they are the result of some catastrophe such as a severe storm or unexpected failure or increase of the food supply. In either case, for obvious reasons, man can do little to influence the operation of these natural forces. With regard, however, to the changes which are due to his own activities he has all power. These result mostly from the clearing of forests, the draining of swamps and marshes, the settling of the country and the consequent cultivation of fields, together with the great destruction of birds for sport or food.

Changes in forest and other vegetation from natural causes or from the settling up of the country and subsequent cultivation have a natural tendency to drive away large birds, such as hawks, eagles, cranes, pelicans, and the like, on account of the elimination or great reduction of their feeding grounds, nesting sites, and shelter. Conversely, such changes often provide places suitable for species new to the region.

Some changes in vegetation are not great or far-reaching enough to eliminate species or to attract others, but cause a greater or less diminution or increase in numbers by new conditions that are favorable or unfavorable, as the case may be. Such is the situation that we most frequently observe, but it may lead eventually to complete extinction of species,

or on the other hand, to the attraction of species foreign to a given area.

Many species of birds of limited range of habitat are utterly unable to adapt themselves to entirely new conditions, so dependent are they on certain factors; as for instance, certain water birds and many strictly forest species, like some woodpeckers; thus, when these factors of their habitat are eliminated the birds are consequently shut out likewise. Such species are, under ordinary circumstances, the first to be exterminated, for they are offered the least opportunity for preservation. Of this, many local instances might be given. Other species are able more or less to adapt themselves to changes in their environment; and to the degree to which they are thus able depends the degree of their salvation. Among birds there are many such cases, as, for instance, the chimney swift, which nested originally in hollow trees, but which the advent of civilization has changed almost universally to the chimneys of buildings; and the cliff swallow, which in settled regions, has largely forsaken its homes on the faces of cliffs for the eaves of barns and other buildings. Many forest birds, on the destruction of the forests in which they live, resort to scattered trees which may be left in cultivated areas or elsewhere, or even to dense chaparral; likewise, birds that live in dense thickets change their abode, on the destruction of their brushy habitat, to the shrubbery of farm land; and other birds which nest in holes of the forest or other trees readily adapt themselves to bird boxes put up by man. Wide-ranging species and those accustomed to a variety of environment, such as many hawks and eagles, are much less influenced by changes in habitat than those of more limited tastes, and are rarely seriously inconvenienced by vegetation changes.

In taking up the direct results of vegetation changes on the birds of Texas, with relation to the above ecological associations, it is of importance to note that a radical alteration of the breeding or feeding place of a species in one association may often eliminate the species from also an adjoining or other association in which it may have been a characteristic species. For instance a shore-bird or other water bird, which had its nesting ground on grassy prairie

and its feeding ground on the beach, would disappear from both associations were its feeding ground for any reason, say cultivation, made unavailable. The same is true of species which, for example, frequent prairie land, but which depend on cover of thickets or woodland for their existence.

In the following pages it is aimed to show as far as possible what might reasonably be expected to happen to the birds in the best characterized of the associational areas should the character of these areas be entirely altered; but birds often do the unexpected, so that our suggestions can be advanced only tentatively. These changes in avifauna are predicated upon actual observations of changed and changing environmental conditions in various parts of Texas and elsewhere. In this the treatment is by manner of change rather than by geographic area, but correlation with the associational areas already delineated may easily be made, and in cases of change from present conditions a reference to the associational lists will show at a glance where the eliminated species would settle, as well as in case of the formation of a new association of plants what birds would be attracted. The increase or decrease of species consequent upon a radical change of environment is not so easy to estimate, for such fluctuations are complicated by other factors, and little or no attempt is here made to discuss such changes. Alterations in habit for the purpose of adaptation to a changed environment are of course much easier to see, and in most cases will be evident without having special attention drawn to them. As will be noticed from the following lists of species, only a small proportion of the birds of any region will actually disappear as the result of even a radical change in character of environment, since by far the larger number soon adapt themselves to their new conditions. The species that do disappear are such as are dependent on certain environment, i. e., characteristic species.

Deforestation and Forestation.

The upland pine forests of eastern Texas harbor no species of bird which is peculiar to them, with the single exception of the pine warbler (*Dendroica pinus pinus*), and this bird would probably disappear were all the pine trees re-

moved. All other species that live in the pine forests or their undergrowth would probably soon become accustomed to other woodland habitats.

In the upland oak and other mixed forests of the eastern uplands there are no species of birds which would disappear were these forests removed, so long as there were other suitable forests remaining, since the birds would soon take up their abode in any other woodlands available.

Of birds confined to the swamps and humid bottomland forests of eastern Texas there are only three that are entirely dependent upon the presence of the forest here, and these three would undoubtedly vanish were the forests removed. These are:

Campephilus principalis
Dendroica cerulea
Protonotaria citrea

If both trees and thickets were destroyed in these areas, suitable homes under the changed conditions would be found for nearly all the species, but the following birds in addition to those given above would doubtless also be eliminated:

Wilsonia citrina
Oporornis formosus
Seiurus motacilla
Helmitheros vermivorus
Limnothypis swainsonii

The destruction of all the forests on both uplands and lowlands throughout the eastern part of the State would result in a much larger elimination of species, although only a comparatively small proportion of the total bird population would disappear. The rest would adapt themselves to their new environment by finding homes in thickets or cultivated areas. Those dependent closely on the forest and apparently doomed to extinction under such a condition as this are as follows:

Buteo lineatus alleni
Ictinia misisippiensis
Elanoides forficatus forficatus
Centurus carolinus
Phloeotomus pileatus pileatus
Phrenopicus boreclis
Dryobates villosus villosus
Dryobates villosus audubonii
Strix varia alleni
Hylocichla mustelina
Sitta pusilla
Sitta carolinensis cookei
Oporornis formosus
Dendroica pinus pinus
Dendroica dominica albilora
Dendroica cerulea
Compsothypis americana ramalinae
Protonotaria citrea

Forestation of any area in this eastern region would of course bring with it the forest association, particularly the birds listed above as reasonably sure to disappear with the forest.

Forestation of all the eastern and central prairies of the State (coast and inland considered together) would so change the character of the country that a number of species unable or unwilling to live in a forested region would probably disappear. Such species are included in the following list:

Tympanuchus americanus attwateri
Colinus virginianus virginianus
Oxyechus vociferus vociferus
Numenius americanus americanus
Catoptrophorus semipalmatus semipalmatus
Himantopus mexicanus
Larus atricilla megalopterus
Gelochelidon nilotica aranea
Hydroprogne caspia imperator
Thalasseus maximus
Thalasseus sandvicensis acuflavidus
Sterna forsteri
Sterna hirundo
Sternula albifrons antillarum
Speotyto cunicularia hypugaea
Muscivora forficata
Otocoris alpestris giraudi
Hirundo rustica erythrogastris
Stelgidopteryx serripennis serripennis
Progne subis subis
Geothlypis trichas trichas
Sturnella magna argutula
Sturnella magna hoopesi
Agelaius phoeniceus phoeniceus (=floridanus)
Megaquiscalus major major
Megaquiscalus major macrourus
Quiscalus quiscula aeneus
Molothrus ater ater
Molothrus ater obscurus
Ammodramus savannarum bimaculatus
Chondestes grammacus strigatus
Spiza americana
Passer domesticus domesticus

The fringes of trees along the streams of the Great Plains, which, with the exception of the small isolated groves about ranch houses, are the only approach to a forest in this region, form an exceedingly attractive place for many kinds of birds. The removal of these fringes of trees would without much doubt cause the disappearance of birds in the following list, just as the natural or artificial extension of such fringes of timber would attract the same species:

Buteo lineatus alleni
Ictinia misisippiensis
Elanoides forficatus forficatus
Colaptes auratus luteus
Centurus carolinus
Melanerpes erythrocephalus erythrocephalus
Dryobates villosus villosus
Otus asio aikeni
Myiarchus cinerascens cinerascens
Myiarchus crinitus crinitus
Tyrannus verticalis
Icterus bullockii bullockii
Icterus galbula

The trees along the streams and in the canyons of the desert areas form likewise an unusual attraction to birds because of the scarcity of arboreal vegetation in such regions. However, the removal of these trees, if the thickets in the same localities were left, would cause the probable disappearance of only a comparatively small number of species. Conversely, the appearance of trees in similar localities would undoubtedly draw the same additional species. A list of these follows:

Coccyzus americanus occidentalis
Colaptes cafer collaris
Pyrocephalus rubinus mexicanus
Horizopus richardsonii richardsonii
Tyrannus verticalis
Lanivireo solitarius plumbeus
Vireosylva gilva swainsonii
Vireosylva olivacea
Icterus bullockii bullockii
Piranga rubra rubra, or *Piranga rubra cooperi.*

The oak and other deciduous forests on the mountains of Texas west of the Pecos River have a great influence on the avifauna. Were these forests all removed, leaving only the undergrowth and the chaparral, the species in the subjoined list would probably follow. Some of these are now to be found in the chaparral below the mountain forests, but occur there largely as visitors from the woodlands, and would disappear if the woods above them ceased to furnish a satisfactory retreat. All but one, *Coccyzus americanus occidentalis*, however, would find refuge in adjoining coniferous forests, if such there were. Conversely, the forestation of mountains with oak and other deciduous forests would attract to a large extent the same list of species. These birds are:

Meleagris gallopavo merriami
Chloroenas fasciata fasciata
Coccyzus americanus occidentalis
Colaptes cafer collaris
Balanosphyra formicivora formicivora, or *Balanosphyra formicivora aculeata*
Otus flammeolus
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Selasphorus platycercus
Nuttallornis borealis majorinus
Horizopus richardsonii richardsonii
Sialia mexicana bairdi
Turdus migratorius propinquus
Sitta carolinensis nelsoni
Penthestes gambeli gambeli
Baeolophus inornatus griseus
Baeolophus atricristatus atricristatus
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Vireo huttoni stephensi
Lanivireo solitarius plumbeus

Vireosylva olivacea
Piranga ludoviciana
Piranga hepatica oreophasma
Piranga rubra cooperi
Hedymeles melanocephalus papago

The pinyon and juniper forests of these mountains harbor a considerable number of species which are more or less dependent on forest conditions; therefore, if the trees were removed, these species would either be exterminated or forced to seek other areas. All except one, *Cyanocephalus cyanocephalus,* would readily find a home in other coniferous forests elsewhere on the mountains, or in the deciduous woods adjacent. In all these mountain forests there is of course a large number of species that live in the undergrowth, the thickets along the streams, or in the chaparral of slopes and valleys, and which, therefore, are not dependent on the actual presence of the forest trees. These of course would remain. The species that probably would disappear or remove with the pinyon and juniper forest are:

Meleagris gallopavo merriami
Chloroenas fasciata fasciata
Colaptes cafer collaris
Balanosphyra formicivora formicivora, or *Balanosphyra formicivora aculeata*
Sphyrapicus varius nuchalis
Dryobates villosus leucothorectis
Otus flammeolus
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Selasphorus platycercus
Nuttallornis borealis majorinus
Horizopus richardsonii richardsonii
Sialia mexicana bairdi
Turdus migratorius propinquus
Sitta pygmaea pygmaea
Sitta carolinensis nelsoni
Penthestes gambeli gambeli
Baeolophus inornatus griseus
Baeolophus atricristatus atricristatus
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Cyanocephalus cyanocephalus
Vireo huttoni stephensi
Lanivireo solitarius plumbeus
Dendroica auduboni memorabilis
Piranga ludoviciana
Piranga hepatica oreophasma
Piranga rubra cooperi
Hedymeles melanocephalus papago
Junco dorsalis

The mountain forest of pine, spruce, and cypress have likewise an important influence on the bird life; and while, as in the case of the other mountain forests, many brush-inhabiting species would soon adapt themselves to the lack of trees, there are a number of birds, as shown by the list below, whose extermination in the area would, it appears probable, follow the removal of the forests. However, all

but those marked with an asterisk (*) would readily remove to either the pinyon and juniper or to the deciduous woods on other slopes of the mountains.

Meleagris gallopavo merriami
Chloroenas fasciata fasciata
Colaptes cafer collaris
Balanosphyra formicivora formicivora or *Balanosphyra formicivora aculeata*
Sphyrapicus varius nuchalis
Dryobates villosus leucothorectis
Otus flammeolus
**Strix occidentalis lucida*
Setochalcis vocifera arizonae
Cyanolaemus clemenciae bessophilus
Selasphorus platycercus
Nuttallornis borealis majorinus
Horizopus richardsonii richardsonii
**Empidonax difficilis*
Sialia mexicana bairdi
Turdus migratorius propinquus
Sitta pygmaea pygmaea
Sitta carolinensis nelsoni
Penthestes gambeli gambeli
Cyanocitta stelleri macrolopha
Aphelocoma sieberii couchii
Vireo huttoni stephensi
Lanivireo solitarius plumbeus
Dendroica auduboni memorabilis
Piranga ludoviciana
Piranga hepatica oreophasma
**Hedymeles melanocephalus papago*
**Junco dorsalis*
**Loxia curvirostra stricklandi*

Destruction and Extension of Thickets.

Thickets form one of the most attractive places for birds, and many species are dependent largely, if not wholly, on them for shelter and nesting sites. Many others, however, which frequent them are at home in other environment, and all such, of course, in case of necessity, readily adapt themselves to a change. Complete destruction of the thickets in the swamps and humid bottomlands of eastern Texas would, it seems likely, cause the disappearance of the subjoined birds:

Rubicola minor
Vireo bellii bellii
Vireo griseus griseus
Wilsonia citrina
Icteria virens virens
Geothlypis trichas trichas
Oporornis formosus
Helmitheros vermivorus
Limnothlypis swainsonii
Richmondena cardinalis magnirostris

Elimination of thickets along the streams of the Great Plains, leaving only the fringe of scattered timber, would be liable to extirpate there the following birds:

Geococcyx californianus
Empidonax traillii brewsteri
Toxostoma rufa longicauda
Polioptila caerulea caerulea
Vireo bellii bellii
Vireo griseus griseus
Icteria virens longicauda
Geothlypis trichas occidentalis

Dendroica aestiva morcomi
Richmondena cardinalis cardinalis or *Richmondena cardinalis magnirostris*
Amphispiza bilineata bilineata
Peucaea cassinii
Chondestes grammacus strigatus
Spiza americana

The thickets along the streams and in the canyons of the desert region are especially attractive to birds, doubtless partly on account of the proximity of water, and their removal would be a corresponding calamity to the bird life. Some species which frequent them would make their home in the adjoining chaparral, but many species would probably disappear entirely, even if the trees of the canyons were left; consequently a growth of thickets in a watered canyon would bring thither practically the same list of species, which is as follows:

Chaemepelia passerina pallescens
Geococcyx californianus
Empidonax traillii brewsteri
Toxostoma crissalis
Toxostoma curvirostris curvirostris
Polioptila melanura
Polioptila caerulea obscura
Thryomanes bewickii eremophilus
Thryothorus ludovicianus ludovicianus
Auriparus flaviceps flaviceps
Vireo bellii bellii, or *Vireo bellii medius*, or *Vireo bellii arizonae*
Vireo atricapillus
Icteria virens longicauda
Geothlypis trichas occidentalis
Dendroica aestiva sonorana
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana, or *Pyrrhuloxia sinuata sinuata*
Passerina versicolor versicolor
Amphispiza bilineata bilineata, or *Amphispiza bilineata deserticola*
Peucaea cassinii
Aimophila ruficeps scottii, or *Aimophila ruficeps eremoeca*

Wherever extensive thickets or areas of brush exist on the eastern uplands of the State they form, as elsewhere, excellent habitats for birds. Their loss, were they replaced by vegetation no more protective to bird life than grass, would, without much doubt, cause the disappearance of such of the following birds as occur in any particular locality thus denuded:

Geococcyx californianus
Coccyzus americanus americanus
Colaptes auratus auratus
Melanerpes erythrocephalus erythrocephalus
Dryobates pubescens pubescens
Otus asio asio
Antrostomus carolinensis
Horizopus virens
Empidonax traillii brewsteri
Empidonax minimus
Myiarchus crinitus crinitus
Dumetella carolinensis
Polioptila caerulea caerulea
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Sitta carolinensis cookei

Penthestes carolinensis carolinensis
Baeolophus bicolor
Cyanocitta cristata cristata (=florincola)
Vireo bellii bellii
Vireo griseus griseus
Lanivireo flavifrons
Icteria virens virens
Geothlypis trichas trichas
Dendroica discolor
Dendroica aestiva aestiva
Icterus galbula
Icterus spurius
Piranga rubra rubra
Richmondena cardinalis magnirostris
Guiraca caerulea caerulea
Passerina ciris ciris
Passerina ciris pallidior
Passerina cyanea
Peucaea aestivalis illinoensis

Destruction of the thickets on the coast prairies of the eastern part of the State, leaving only a grassy area, would naturally result in the disappearance of a number of birds which are practically dependent on such vegetation, particularly in areas which have no forest. These birds are included in the subjoined list:

Meleagris gallopavo silvestris
Colaptes auratus auratus
Melanerpes erythrocephalus erythrocephalus
Dryobates pubescens pubescens
Antrostomus carolinensis
Polioptila caerulea caerulea
Thryothorus ludovicianus ludovicianus
Penthestes carolinensis carolinensis
Vireo bellii bellii
Vireo griseus griseus
Icteria virens virens
Geothlypis trichas trichas
Richmondena cardinalis magnirostris
Guiraca caerulea caerulea
Paserina ciris ciris
Spizella passerina passerina

Destruction and Extension of Chaparral

The chaparral that covers the level or rolling country in the central southern part of Texas forms one of the most important factors in the distribution of bird life in all the State. It furnishes shelter and suitable nesting sites for a very large number of species, particularly such as depend on cover for protection and food. The entire destruction of this chaparral, leaving only a bare or grassy area, would probably have a more profound effect on the avifauna than the destruction of any other kind of vegetation in any part of the State. The species that, it seems, would thereby be practically eliminated from the region in question are comprised in the following list. Some of these of course might eke out a scanty existence under the changed environment, but few of them would remain at all. The list is as follows:

Rhynchofalco fuscocoerulescens septentrionalis
Buteo borealis borealis
Buteo lineatus alleni
Buteo lineatus texanus
Buteo platypterus platypterus
Urubitinga anthracina
Parabuteo unicinctus harrisi
Ortalis vetula vetula
Meleagris gallopavo intermedia
Melopelia asiatica asiatica
Leptotila fulventris angelica
Chloroenas flavirostris flavirostris
Crotophaga sulcirostris sulcirostris
Geococcyx californianus
Coccyzus americanus americanus
Centurus aurifrons
Centurus carolinus
Phloeotomus pileatus pileatus
Dryobates scalaris symplectus
Glaucidium brasilianum ridgwayi
Bubo virginianus virginianus
Bubo virginianus pallescens
Otus asio mccallii
Strix varia helveola
Antrostomus carolinensis
Phalaenoptilus nuttallii nuttallii
Nyctidromus albicollis merrilli
Amazilia yucatanensis chalconota
Camptostoma imberbe
Pyrocephalus rubinus mexicanus
Horizopus virens
Empidonax minimus
Myiarchus cinerascens cinerascens
Myiarchus magister nelsoni
Myiarchus crinitus crinitus
Pitangus sulphuratus derbianus
Toxostoma curvirostris curvirostris
Toxostoma longirostris sennetti
Mimus polyglottos leucopterus
Polioptila melanura
Polioptila caerulea caerulea
Thryomanes bewickii cryptus
Thryothorus ludovicianus ludovicianus
Thryothorus ludovicianus lomitensis
Heleodytes brunneicapillus couesi
Auriparus flaviceps flaviceps
Penthestes carolinensis agilis
Baeolophus atricristatus atriscristatus
Baeolophus atricristatus sennettii
Baeolophus bicolor
Xanthoura luxuosa glaucescens
Vireo bellii bellii
Vireo griseus griseus
Vireo griseus micrus
Lanivireo flavifrons
Icteria virens virens
Icteria virens longicauda
Chamaethlypis poliocephala poliocephala
Dendroica aestiva aestiva
Icterus bullockii bullockii
Icterus cucullatus sennetti
Icterus melanocephalus audubonii
Icterus spurius
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Arremonops rufivirgatus rufivirgatus
Amphispiza bilineata bilineata
Peucaea cassinii
Astragalinus psaltria psaltria

When on the level grassy coast prairies the chaparral spreads and usurps the land, it brings with it practically all the species in the above list, but incidentally at the same time it usually causes the disappearance of the following prairie-dwelling species:

Tympanuchus americanus attwateri
Rallus longirostris saturatus
Oxyechus vociferus vociferus

Catoptrophorus semipalmatus semipalmatus
Himantopus mexicanus
Otocoris alpestris giraudi
Sturnella magna argutula, or *Sturnella magna hoopesi*
Thryospiza maritima fisheri, or *Thryospiza maritima sennetti*

Likewise in the central broken area of Texas, where the chaparral covers the hills and dales, its destruction anywhere, leaving only the grass behind, apparently eliminates such of the following large number of birds as live in that particular locality:

Buteo lineatus texanus
Meleagris gallopavo intermedia
Geococcyx californianus
Coccyzus americanus americanus
Coccyzus americanus occidentalis
Centurus aurifrons
Centurus carolinus
Balanosphyra formicivora formicivora
Melanerpes erythrocephalus erythrocephalus
Phloeotomus pileatus pileatus
Dryobates scalaris symplectus
Dryobates pubescens pubescens
Otus asio hasbroucki
Strix varia helveola
Antrostomus carolinensis
Phalaenoptilus nuttallii nuttallii
Archilochus alexandri
Archilochus colubris
Horizopus virens
Empidonax traillii brewsteri
Empidonax minimus
Myiarchus cinerascens cinerascens
Myiarchus crinitus crinitus
Polioptila caerulea caerulea
Thryothorus ludovicianus ludovicianus
Heleodytes brunneicapillus couesi
Sitta carolinensis carolinensis (=*aikeni*)
Penthestes carolinensis agilis
Baelophus atricristatus sennetti
Baeolophus bicolor
Cyanocitta cristata bromia
Aphelocoma californica texana
Vireo bellii bellii
Vireo griseus griseus
Vireo atricapillus
Lanivireo flavifrons
Icteria virens virens
Dendroica chrysoparia
Dendroica aestiva aestiva
Icterus bullockii bullockii
Icterus spurius
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Guiraca caerulea lazula
Passerina ciris pallidior
Passerina amoena
Passerina cyanea
Amphispiza bilineata bilineata
Peucaea cassinii
Astragalinus psaltria psaltria

The chaparral that covers the desert plains and mesas in the trans-Pecos region is likewise a very important factor in the bird life. The removal of this vegetation, which furnishes food, shelter, and nesting sites for a large bird population, leaving only short grass or bare ground over its entire present area in the State, would probably cause the disappearance of the following birds:

Rhynchofalco fuscocoerulescens septentrionalis

Lophortyx gambelii gambelii
Callipepla squamata pallida
Colinus virginianus texanus
Chaemepelia passerina pallescens
Scardafella inca
Geococcyx californianus
Centurus aurifrons
Dryobates scalaris symplectus
Dryobates scalaris cactophilus
Otus asio cineraceus
Phalaenoptilus nuttallii nuttallii
Archilochus alexandri
Pyrocephalus rubinus mexicanus
Horizopus richardsonii richardsonii
Myiarchus cinerascens cinerascens
Tyrannus verticalis
Tyrannus vociferans
Toxostoma crissalis
Toxostoma curvirostris curvirostris
Mimus polyglottos leucopterus
Polioptila melanura
Polioptila caerulea obscura
Thryomanes bewickii cryptus
Thryomanes bewickii eremophilus
Heleodytes brunneicapillus couesi
Auriparus flaviceps flaviceps
Aphelocoma californica texana
Aphelocoma californica woodhouseii
Vireo bellii bellii
Vireo bellii medius
Vireo bellii arizonae
Icteria virens longicauda
Icterus parisorum
Icterus cucullatus sennetti
Icterus spurius
Richmondena cardinalis canicauda
Pyrrhuloxia sinuata texana
Pyrrhuloxia sinuata sinuata
Guiraca caerulea lazula
Passerina versicolor versicolor
Passerina ciris pallidior
Passerina amoena
Spizella passerina arizonae
Amphispiza bilineata bilineata
Amphispiza bilineata deserticola
Peucaea cassinii
Astragalinus psaltria psaltria

Destruction and Extension of Herbaceous Vegetation.

The open grassy prairies in the eastern and middle portions of Texas, including the coast region, have a more or less peculiar avifauna. The removal of the grass and other herbaceous vegetation, leaving only the bare ground, causes usually the departure of the following birds:

Dendrocygna autumnalis
Meleagris gallopavo silvestris
Tympanuchus americanus attwateri
Colinus virginianus virginianus
Rallus longirostris saturatus
Chaemepelia passerina pallescens
Otus asio asio
Strix varia alleni
Archilochus colubris
Geothlypis trichas trichas
Sturnella magna argutula
Agelaius phoeniceus phoeniceus (=floridanus)
Thryospiza maritima fisheri
Ammodramus savannarum bimaculatus
Spiza americana

The hydrophytic vegetation of the lakes and ponds on the Great Plains in Texas does not harbor a large number of species of birds, but a few of these would doubtless disap-

pear following the destruction of this vegetation. These are:

Botaurus lentiginosus
Fulica americana
Xanthocephalus xanthocephalus
Agelaius phoeniceus fortis

The marshes of the eastern coast of Texas have likewise a somewhat peculiar avifauna. Practically all of the species which nest here are directly dependent on the distinctively marsh vegetation, and they naturally disappear with this. These birds are:

Colymbus dominicus brachypterus
Ixobrychus exilis exilis
Botaurus lentiginosus
Querquedula discors
Dendrocygna bicolor
Fulica americana
Gallinula chloropus cachinnans
Porphyrula martinica
Rallus longirostris saturatus
Tyrannus tyrannus tyrannus
Telmatodytes palustris thryophilus
Geothlypis trichas trichas
Agelaius phoeniceus phoeniceus (=floridanus)
Thryospiza maritima fisheri

Cultivation.

The settlement of an area of country by man has its inevitable effect upon the bird life. The consequent change in vegetation often displaces species not suited to the changed environment or to the disturbance of natural conditions that the presence of man occasions. On the other hand, it creates a favorable environment for additional species by providing an abundant food supply and suitable surroundings, and birds accordingly follow up the advance of civilization. Among these influences might be mentioned the draining of swamps, the cutting down of forests, the creation of grain fields and meadows, and the planting of ornamental trees and shrubbery. The cultivation of the country, moreover, serves in the same way to attract increased numbers of some species of birds. There is no more conspicuous example of this than the rice fields of the coast prairies, which in a way, supply the place of marshes. They draw multitudes of the red-winged (*Agelaius*) and other blackbirds, the three species of grackles (*Quiscalus quiscula aeneus, Megaquiscalus major major,* and *Megaquiscalus major macrourus*), the cowbirds (*Molothrus ater ater* and *Molothrus ater obscurus*); also great numbers of geese, ducks, terns, shorebirds, and herons, particularly the little blue heron (*Florida caerulea caerulea*). The cultivation of the uplands, especial-

ly in parts of eastern Texas, has also had the effect of increasing the numbers of certain birds, and for similar reasons. Among such species might be mentioned the red-headed woodpecker (*Melanerpes erythrocephalus erythrocephalus*), the wood pewee (*Horizopus virens*), the mocking-bird (*Mimus polyglottos polyglottos*), the common crow (*Corvus brachyrhynchos brachyrhynchos*), the meadowlark (*Sturnella magna magna*), the field sparrow (*Spizella pusilla pusilla*), and the chipping sparrow (*Spizella passerina passerina.*) Some species take so readily to the advent of men that they have even changed their breeding habits, and now nest often or exclusively about his habitations or in boxes put up for their convenience. Conspicuous among such species are the phoebe (*Sayornis phoebe*), the chimney swift (*Chaetura pelagica*), the purple martin (*Progne subis*), the barn swallow (*Hirundo rustrica erythrogastris*), the cliff swallow (*Petrochelidon albifrons albifrons*), the bluebird (*Sialia sialis sialis*), the Texas wren (*Thryomanes bewickii cryptus*), and the Carolina wren (*Thryothorus ludovicianus ludovicianus*).

The changes that cultivation and the proximity of human habitations occasion may readily be seen by comparing the bird list on pages 593—596 for the Eastern Agrarian Association with the lists of birds for other associations in various kinds of habitats that might be converted into cultivated areas.

Changes in Bird Life not Due to Vegetation.

Many changes in bird life take place which are not properly attributable to changes in vegetation. Of these there are at least six direct causes: (1) natural enemies; (2) diseases; (3) storms and floods; (4) drought; (5) fires; and (6) man. Although, of course, strictly these should not be included with the effects of vegetation, they are here added for the sake of completeness.

The natural enemies of birds are chiefly mammals (including cats) and rapacious birds. Loss of life is the chief effect that these natural enemies have on birds. It is seldom, however, that a species of bird is wholly exterminated through the agency of its natural enemies, though these

enemies serve often greatly to reduce its numbers, particularly within small areas.

Diseases sometimes deplete the ranks of birds locally, but rarely ever have any disastrous effect upon the species as a whole.

Storms and floods at times have a very important bearing on the distribution and fluctuation in the numbers of birds. In addition to their indirect influence by the destruction of forests and other suitable nesting sites, which often drives away from certain localities the birds that were nesting there, severe storms, particularly during the migration season, have been known to destroy thousands of birds at a time, thus reducing very materially the total number of individuals. Storms and floods during the nesting period frequently destroy the nests of birds over a wide area, particularly water birds, shore-birds, and other species that build open nests on the ground.

A prolonged drought in regions where birds depend much upon water for both nesting sites and for the aquatic vegetation which supplies their food sometimes results in considerable loss of bird life, and in this way occasions considerable fluctuation in the abundance of certain species. This, however, is one of the least important influences that affect bird life.

Fires in prairie regions, especially during the breeding season, are very destructive to ground-nesting birds, like prairie chickens and small sparrows, and in certain instances have locally caused practical extermination of some species.

The most potent influence in the reduction of the numbers of certain birds is the hunter who pursues them for sport or for their plumage or for food. This has caused much reduction of birds in Texas. Three species have, wholly or partly by means of this, become entirely or practically extinct: the passenger pigeon (*Ectopistes canadensis*), the Louisiana paroquet (*Conuropsis carolinensis ludovicianus*), and the Eskimo curlew (*Mesoscolopax borealis*). Others which everywhere have been very much depleted in numbers by hunting are the whooping crane (*Leucogeranus americanus*), the trumpeter swan (*Cygnus buccinator*), the whist-

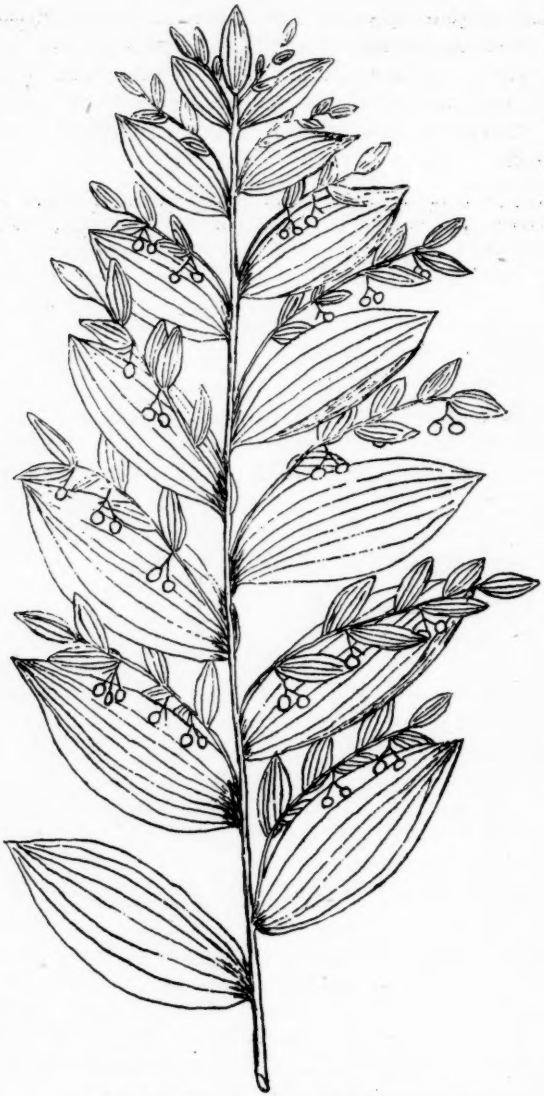
ling swan (*Cygnus columbianus*), the wild turkeys (*Meleagris gallopavo silvestris* and *Meleagris gallopavo intermedia*), and the prairie chickens (*Tympanuchus americanus americanus* and *Tympanuchus americanus attwateri*). Hunting has had a decided effect on the numbers of also the brown pelican (*Pelecanus occidentalis occidentalis*), upon the curlews, sandpipers, particularly *Bartramia longicauda*, some species of plovers, especially the golden plover (*Pluvialis dominica dominica*), ducks, especially the wood duck (*Aix sponsa*), and the various species of geese. None, however, have suffered more than the gulls, terns, herons, and their allies, which have been persistently and relentlessly pursued by the plume hunter. Those birds that have most decreased from this cause are the laughing gull (*Larus atricilla megalopterus*), the gull-billed tern (*Gelochelidon nilotica aranea*), the common tern (*Sterna hirundo*), the least tern (*Sternula albifrons antillarum*), the royal tern (*Thalasseus maximus*), the snowy egret (*Leucophoyx thula thula*), the American egret (*Casmerodius alba egretta*), the wood ibis (*Mycteria americana*), the white ibis (*Guara alba*), the roseate spoonbill (*Ajaia ajaja*), and the black skimmer (*Rynchops nigra*).

On the other hand, man often, by protecting and encouraging the birds about him, partially at least counteracts the effect of the injury that his activities do to bird life. By this, not only do birds increase in numbers in the areas under protection, but frequently there appear species that before were not known in the locality. Furthermore, in Texas a few colonies of birds seem to be growing larger as the result of protection. This concerns principally the royal tern (*Thalasseus maximus*), the least tern (*Sternula albifrons antillarum*), the laughing gull (*Larus atricilla megalopterus*), and the black skimmer (*Rynchops nigra*).

Another means of furthering bird life, that of introduction from other regions, though carried out with success in some other States, has been little tried in Texas. The most conspicuous example of this, so far as Texas is concerned, is the English sparrow (*Passer domesticus domesticus*), which, originally introduced into Texas at several localities, has spread over practically the entire State and is still on the

increase. A few sporadic and more or less ineffectual attempts have been made to introduce the bob-white (*Colinus virginianus*), into some localities in Texas where practically exterminated, and also one or two attempts to import Old World pheasants, but without any permanent success in either case.

(Note.—The unfortunate typographical errors on pages 564—594 of this article are due to the lack of opportunity for proof reading by the author.)



POLYGONATUM COMMUTATUM RAMOSUM.

AN UNUSUAL POLYGONATUM

SISTER VINCENT DE PAUL MCGIVNEY, I. H. M.

On a recent botanical trip at Notre Dame a rather remarkable specimen of Solomon's Seal (*Polygonatum commutatum*) was found, a description of which may prove of interest.

The specimen grew on a woody hillside, one mile southeast of the University. About 5 specimens were grouped together in that spot, and several ordinary Polygonata near it. The plant is now in the Notre Dame herbarium. A copy of the drawing made of it is here reproduced.

The plant in question attracted immediate attention on account of its unusual monopodial branching from the main stem, a habit which is entirely foreign to any species of Polygonatum. It was some 5dm. high; the main stem had about 15 leaves, 8-10cm. long and 4-5cm. wide. From the axil of each leaf a conspicuous branch appeared, ranging in length from about 18cm. on the lower part of the stem to 4 or 5cm. at the apex. The lower branches bore 5 to 6 half-clasping, ovate-lanceolate leaves, like the leaves of the main stem, but smaller, 5-6cm. long, 18-20 mm. wide. The leaves on the branches towards the apex were fewer and much smaller.

As the season of flowering was past the plant bore only the fruit. This in the form of green, globular berries appeared on the under side of the branches on short pedicels 2.5-3cm. in length, joined near the fruit. There were from 4 to 6 berries on the lower, larger branches and none on the shorter, apical ones. There was no fruit at all borne on the main stem as is ordinarily the case in Polygonatum.

Whether this plant may become a new variety of *Polygonatum commutatum* or is simply a branching form of the species that appears only to disappear again remains for future observation. The rootstock was not disturbed and several small plants left for future reference.

As far as could be ascertained no similar specimens of Polygonatum have been reported from this section of the country, although one quite like it was found at Christiana Lake, Mich., north of Elkhart, Ind., in the summer of 1924.

Polygonatum commutatum forma **ramosum.**

Planta de rhizomate reptante et nodosa oriens, sicut in typica. Caulis singularis, robustus, erectus, teres, 5dm. altus, glabra. Folia oblonga et apicem versus sensim angustata, integra, sessilia 8-10cm. longa, 4-5 lata, alternata in cauli et secunda. *A. P. Commutato* differt eo quod ex axillis foliorum ramos manifestos prope 18cm. longos basi et 5cm. apici habet. Folia ramulorum sessilia ovata et breviora quam ea in cauli, 4 usque 5 fructus globularis, virides sub ramis, in pedicelibus brevibus, 2-3cm. in longitudine feruntur. Cauli principali omnino desunt flores vel fructus.

Planta 22003, Nostrae Dominae, Ind., in silva sub Quercus die 14 Julii, 1925, collecta typica. Alia 22002 proxima Lacu Christiana, Mich., australi mensis Aug. 10, 1924, similis est praecedentibus.